



IEC 60728-1

Edition 4.0 2007-09

INTERNATIONAL STANDARD

**Cable networks for television signals, sound signals and interactive services –
Part 1: System performance of forward paths**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE **XG**

ICS 33.060.40

ISBN 2-8318-9264-3

CONTENTS

FOREWORD.....	9
INTRODUCTION.....	11
1 Scope.....	16
2 Normative references.....	17
3 Terms, definitions, symbols and abbreviations.....	19
3.1 Terms and definitions.....	19
3.2 Symbols.....	29
3.3 Abbreviations.....	33
4 Methods of measurement at system outlet.....	32
4.1 General.....	32
4.2 Mutual isolation between system outlets.....	34
4.2.1 Introduction.....	34
4.2.2 Equipment required.....	34
4.2.3 Connection of the equipment.....	34
4.2.4 Measurement procedure.....	35
4.2.5 Presentation of the results.....	36
4.3 Amplitude response within a channel.....	36
4.3.1 Introduction.....	36
4.3.2 Equipment required.....	36
4.3.3 Connection of the equipment.....	36
4.3.4 Measurement procedure.....	37
4.3.5 Presentation of the results.....	39
4.4 Chrominance-luminance gain and delay inequalities.....	39
4.4.1 Introduction.....	39
4.4.2 Equipment required.....	40
4.4.3 Connection of the equipment.....	40
4.4.4 Measurement procedure.....	40
4.4.5 Presentation of the results.....	42
4.5 Non-linear distortion.....	42
4.5.1 General.....	42
4.5.2 Intermodulation.....	42
4.5.3 Composite beat.....	42
4.5.4 Composite crossmodulation.....	47
4.5.5 Intermodulation noise.....	47
4.5.6 Hum modulation of carriers.....	47
4.5.7 Differential gain and phase.....	52
4.6 Carrier-to-noise ratio.....	56
4.6.1 Introduction.....	56
4.6.2 Equipment required.....	56
4.6.3 Connection of the equipment.....	56
4.6.4 Measurement set-up.....	57
4.6.5 Measurement procedure.....	57
4.6.6 Presentation of the results.....	58
4.7 Echoes.....	58
4.7.1 Introduction.....	58

4.7.2	Equipment required	59
4.7.3	Connection of the equipment	60
4.7.4	Measurement procedure	60
4.7.5	Presentation of the results	60
4.8	AM-VSB television, FM radio and FM television signal level	60
4.8.1	General	60
4.8.2	Definitions for NTSC, PAL and SECAM systems	61
4.8.3	Equipment required	61
4.8.4	Measurement procedure	61
4.8.5	Presentation of the results	62
4.9	Data echo rating and data delay inequality	62
4.10	Interference in FM sound radio channels	62
4.11	Methods of measurement for digitally modulated signals	62
4.11.1	Introduction	62
4.11.2	Basic assumptions and measurement interfaces	62
4.11.3	Signal level for digitally modulated signals	65
4.11.4	RF signal-to-noise ratio $S_{D,RF}/N$ for digitally modulated signals	66
4.11.5	Bit error ratio (BER)	68
4.11.6	<i>BER</i> versus E_b/N_0 or C/N	69
4.11.7	Noise margin	72
4.11.8	Modulation error ratio (MER)	74
4.11.9	Phase jitter	76
4.11.10	Phase noise of an RF carrier	78
5	Performance requirements at system outlet	81
5.1	General	81
5.2	Impedance	82
5.3	Requirements at the terminal input	82
5.3.1	Signal level	82
5.3.2	Other parameter	83
5.4	Carrier levels at system outlets	83
5.4.1	Minimum and maximum carrier levels	83
5.4.2	Carrier level differences	84
5.5	Mutual isolation between system outlets	85
5.5.1	Isolation between two subscribers	85
5.5.2	Isolation between individual outlets in one household	85
5.5.3	Isolation between forward and return path	85
5.6	Frequency response within a television channel at any system outlet	86
5.6.1	Amplitude response	86
5.6.2	Group delay	86
5.7	Long-term frequency stability of distributed carrier signals at any system outlet	87
5.8	Random noise	88
5.9	Interference to television channels	89
5.9.1	Single-frequency interference	89
5.9.2	Single-channel intermodulation interference	90
5.9.3	Multiple frequency intermodulation interference	90
5.9.4	Intermodulation noise	90
5.9.5	Cross-modulation	91
5.10	Video baseband requirements	91

5.10.1	Differential gain and phase in any television channel.....	91
5.10.2	Echoes	91
5.10.3	Amplitude and phase response for PALplus signals.....	91
5.11	Hum modulation of carriers in television channels	91
5.12	Requirements for data signal transmission	92
5.12.1	Data signals carried in the structure of a television signal.....	92
5.12.2	Data signals other than those carried within the structure of a television signal.....	92
5.13	Digitally modulated signals – Additional performance requirements.....	93
5.13.1	DVB (PSK, QAM, OFDM) performance	93
5.13.2	NICAM performance	94
5.13.3	DAB performance	94
5.14	FM sound radio – Additional performance requirements	95
5.14.1	Amplitude response within an FM channel.....	95
5.14.2	Phase response within an FM channel.....	95
5.14.3	Interference within an FM channel.....	95
5.14.4	AM hum modulation on FM sound carriers.....	95
5.14.5	Echoes within an FM channel.....	95
6	Performance requirements at receiving antennas	95
6.1	Introduction	95
6.2	Method of measurement of field strength.....	96
6.2.1	Introduction	96
6.2.2	Equipment required	96
6.2.3	Connection of the equipment.....	96
6.2.4	Measurement procedure.....	96
6.2.5	Presentation of the results	98
6.3	Requirements.....	98
6.3.1	General	98
6.3.2	Field strength requirements	98
6.3.3	Quality of received signals.....	100
6.3.4	Safety.....	104
6.3.5	Electromagnetic compatibility (EMC)	104
6.4	Interference reduction	104
6.4.1	General	104
6.4.2	Active antennas.....	104
7	Performance requirements at home network interfaces of cable networks	104
7.1	Introduction	104
7.2	Requirements at HNI1 for passive coaxial home networks.....	106
7.2.1	General	106
7.2.2	Carrier levels at the HNI1	106
7.2.3	Mutual isolation between two HNI1	108
7.2.4	Frequency response within any television channel at the HNI1.....	109
7.2.5	Long-term frequency stability of distributed carrier signals at HNI1.....	110
7.2.6	Random noise at the HNI1.....	110
7.2.7	Interference to television channels at the HNI1.....	110
7.2.8	Return path requirements at the HNI1	111
7.3	Requirements at HNI2 for active coaxial home networks	111
7.3.1	Carrier levels at the HNI2	111
7.3.2	Mutual isolation between two HNI2.....	113

7.3.3	Frequency response within any television channel at the HNI2	113
7.3.4	Long-term frequency stability of distributed carrier signals at HNI2	114
7.3.5	Random noise at HNI2	114
7.3.6	Interference to television channels at the HNI2	116
7.3.7	Return path requirements at the HNI2	117
7.4	Requirements at HNI3 and at system outlet or terminal input when the home network is mainly of balanced type	118
7.4.1	Introduction	118
7.4.2	Requirements at HNI3	118
7.4.3	Requirements at system output	118
7.4.4	Additional requirements at HNI3 for upstream transmission	119
7.5	Requirements at HNI3 (Case C)	119
7.6	Requirements at HNI3 (Case D)	119
Annex A (normative)	Calibration of modulation depth	120
Annex B (normative)	Equipment required – Additional items	121
Annex C (normative)	Preliminary checks on the measuring equipment for carrier-to-noise ratio	122
Annex D (normative)	Correction factors	123
Annex E (normative)	Calibration of the measuring receiver	124
Annex F (normative)	Correction factors for noise	125
Annex G (normative)	Null packet and PRBS definitions	127
Annex H (normative)	Digital signal level and bandwidth	129
Annex I (normative)	Correction factor for a spectrum analyser	132
Annex J (informative)	Differences in some countries	133
Annex K (informative)	Examples of home network implementation	143
Bibliography	151
Figure 1	– Example of a master antenna television system (MATV) for terrestrial reception	12
Figure 2	– Example of the headend of a master antenna television system for satellite (SMATV) reception	13
Figure 3	– Example of a master antenna television system for terrestrial and satellite (SMATV) reception	13
Figure 4	– Example of a cabled distribution system for television and sound signals	14
Figure 5	– System model for downstream direction of a cable network for television and sound signals (CATV)	15
Figure 6	– Arrangement of test equipment for measurement of mutual isolation between system outlets	35
Figure 7	– Arrangement of test equipment for measurement of frequency response within a channel	37
Figure 8	– Interpretation of displays for measurement of frequency response within a channel	38
Figure 9	– Test signal (signal <i>F</i> for 625-line systems) employed for chrominance/luminance gain and delay inequality	39
Figure 10	– Test signal (signal <i>B2</i> for 625-line systems) employed for chrominance/luminance gain and delay inequality	39

Figure 11 – Arrangement of test equipment for measurement of chrominance/luminance gain and delay inequality.....	40
Figure 12 – Displayed pulses: chrominance low and lagging.....	41
Figure 13 – Displayed pulses: chrominance high and leading.....	41
Figure 14 – Connection of test equipment for the measurement of non-linear distortion by composite beat.....	43
Figure 15 – Weighting curve for 625-line system B, G and D1 (PAL): CW interference with no special (frequency offset) control.....	45
Figure 16 – Weighting curve for 625-line system I (PAL): CW interference with no special (frequency offset) control.....	45
Figure 17 – Weighting curve for 625-line systems D and K (PAL): CW interference with no special (frequency offset) control.....	46
Figure 18 – Weighting curve for 625-line system L (SECAM): CW interference with no special (frequency offset) control.....	46
Figure 19 – Hum modulation envelope (x = percentage peak-to-peak hum modulation).....	47
Figure 20 – Calibrated potential divider.....	48
Figure 21 – Stable variable DC source.....	48
Figure 23 – Oscilloscope display.....	49
Figure 24 – Connection of equipment for hum modulation measurement (AC method).....	51
Figure 25 – Signal D2.....	52
Figure 26 – Example of the modified staircase waveform.....	53
Figure 27 – Arrangement of test equipment for measurement of differential gain and phase.....	54
Figure 28 – Arrangement of test equipment for carrier-to-noise ratio measurement.....	57
Figure 29 – Echo rating graticule.....	59
Figure 30 – Arrangement of test equipment for measurement of echo rating.....	60
Figure 31 – I/Q signal source and RF modulator.....	63
Figure 32 – Reference receiver.....	64
Figure 33 – Test set-up for BER measurement.....	68
Figure 34 – Test set-up for BER measurement versus E_b/N_0 or C/N and noise margin measurement.....	70
Figure 35 – Example of BER measurement versus E_b/N_0	72
Figure 36 – Example of BER measurement versus C/N	72
Figure 37 – Test set-up for modulation error ratio (MER) measurement and phase jitter measurement.....	75
Figure 38 – Example of constellation diagram for a 64 QAM modulation format.....	76
Figure 39 – Example of constellation diagram for a 64 QAM modulation format with distortions due to phase jitter.....	78
Figure 40 – Test set-up for phase noise measurement.....	79
Figure 41 – Example of mask for phase noise measurements: PSK, APSK and QAM formats.....	81
Figure 42 – Example of mask for phase noise measurements: OFDM format.....	81
Figure 43 – Home network types used to define the requirements at HNIi (coaxial).....	105
Figure A.1 – Calibration of modulation depth.....	120
Figure F.1 – Noise correction factor CF versus measured level difference D	126

Figure J.1 – Mask group delay characteristic for PAL signals with FM-FM sound (Netherlands).....	135
Figure J.2 – Single-frequency interference (VSB-AM NTSC) (Japan).....	136
Figure J.3 – Single-frequency interference (VSB-AM HDTV) (Japan).....	137
Figure J.4 – Single-frequency interference (64 QAM digital) (Japan).....	137
Figure J.5 – Requirement for echo loss in relation to the time delay of the reflected signal (Netherlands).....	138
Figure J.6 – Echoes (VSB-AM NTSC) (Japan).....	139
Figure J.7 – Echoes (FM NTSC) (Japan).....	139
Figure J.8 – Echoes (FM HDTV) (Japan).....	140
Figure J.9 – Echoes (VSB-AM HDTV) (Japan).....	140
Figure J.10 – Echoes (64 QAM digital) (Japan).....	141
Figure K.1 – Examples of HNI.....	145
Table 1 – Application of the methods of measurement.....	33
Table 2 – Residual carrier reduction factors.....	50
Table 3 – Frequency distance f_m	81
Table 4 – Carrier signal levels at any system outlet.....	83
Table 5 – Maximum level differences at any system outlet between distributed television channels.....	84
Table 6 – Mutual isolation.....	85
Table 7 – Residual carrier level at television or FM radio output within the same outlet or between two different outlets.....	86
Table 8 – Amplitude response variation.....	86
Table 9 – Group delay variation.....	87
Table 10 – Maximum deviation of conversion frequency for digitally modulated DVB signals.....	88
Table 11 – Carrier-to-noise ratios at system outlet (television).....	88
Table 12 – Carrier-to-noise ratios at system outlet (radio).....	89
Table 13 – Differential gain and phase in television channels.....	91
Table 14 – Modulation error ratio MER of a DVB signal.....	93
Table 15 – Phase jitter of a DVB signal.....	93
Table 16 – Phase noise of a DVB signal (PSK, APSK and QAM).....	94
Table 17 – Phase noise of a DVB-T signal (COFDM).....	94
Table 18 – Minimum field strength levels recommended by ITU-R.....	99
Table 19 – Minimum field strength levels recommended by CEPT [3].....	99
Table 20 – Minimum signal level at the headend input for the reception of analogue sound broadcasting.....	100
Table 21 – Minimum signal level at the headend input for the reception of analogue television broadcasting.....	100
Table 22 – Minimum signal level at the headend input for the reception of DAB signals at an error ratio of $1 \cdot 10^{-4}$ and code rate 1/2.....	101
Table 23 – Minimum signal level and RF signal-to-noise ratio at the headend input for stationary reception.....	101
Table 24 – Minimum signal level and carrier-to-noise ratio at the headend input for the reception of FM modulated satellite signals.....	102

Table 25 – Minimum RF signal-to-noise ratio at the headend input for the reception of DVB-S or DVB-S2 satellite signals	102
Table 26 – Minimum values for signal-to-disturbance ratio	103
Table 27 – Minimum values for signal-to-echo ratio	103
Table 28 – Signal level at HNI1	107
Table 29 – Maximum level differences at HNI1	108
Table 30 – Mutual isolation between two HNI1	109
Table 31 – Amplitude response variation at HNI1	109
Table 32 – Group delay variation at HNI1	110
Table 33 – Signal level at HNI2	112
Table 34 – Maximum level differences at HNI2	113
Table 35 – Amplitude response variation at HNI2	114
Table 36 – Group delay variation at HNI2	114
Table 37 – Carrier-to-noise ratios at HNI2 (television)	115
Table 38 – Carrier-to-noise ratios at HNI2 (radio)	116
Table 39 – Minimum signal level at coaxial terminal input (case A) or coaxial system outlet (case B)	118
Table F.1 – Noise correction factor	125
Table G.1 – Null transport stream packet definition	128
Table H.1 – Examples of bandwidths for digital modulation techniques	131
Table K.1 – Example of home network with coaxial cabling (passive) from HNI1 to SO	149
Table K.2 – Example of home network with coaxial cabling (active) from HNI2 to SO	149
Table K.3 – Example of home network with balanced pair cables (active) from HNI3 to coaxial terminal input (case A)	150
Table K.4 – Example of home network with balanced pair cables (active) from HNI3 to coaxial SO (case B)	150

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLE NETWORKS FOR TELEVISION SIGNALS,
SOUND SIGNALS AND INTERACTIVE SERVICES –****Part 1: System performance of forward paths**

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.
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International Standard IEC 60728-1 has been prepared by technical area 5: Cable networks for television signals, sound signals and interactive services, 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.

This edition includes the following significant technical changes with respect to the previous edition:

- redrafting of introduction and scope to reflect the current scope of IEC TC 100/TA 5;
- redrafting of measurement procedure for bit error ratio (BER);
- updating of performance requirements in Clause 5;
- inclusion of new Clause 6;
- inclusion of new Clause 7;

- inclusion of new Annex K.

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

FDIS	Report on voting
100/1242/FDIS	100/1274/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 2.

The list of all the parts of the IEC 60728 series, under the general title *Cable networks for television signals, sound signals and interactive services*, can be found on the IEC web site.

For the differences in some countries, see Annex J.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://www.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

Standards of the IEC 60728 series deal with cable networks including equipment and associated methods of measurement for headend reception, processing and distribution of television signals, sound signals and their associated data signals and for processing, interfacing and transmitting all kinds of signals for interactive services using all applicable transmission media.

This includes

- CATV¹-networks;
- MATV-networks and SMATV-networks;
- individual receiving networks;

and all kinds of equipment, systems and installations installed in such networks.

The extent of this standardization work is from the antennas and/or special signal source inputs to the headend or other interface points to the network up to the terminal input.

The standardization of any user terminals (i.e., tuners, receivers, decoders, multimedia terminals, etc.) as well as of any coaxial, balanced and optical cables and accessories thereof is excluded.

The reception of television signals inside a building requires an outdoor antenna and a distribution network to convey the signal to the TV receivers.

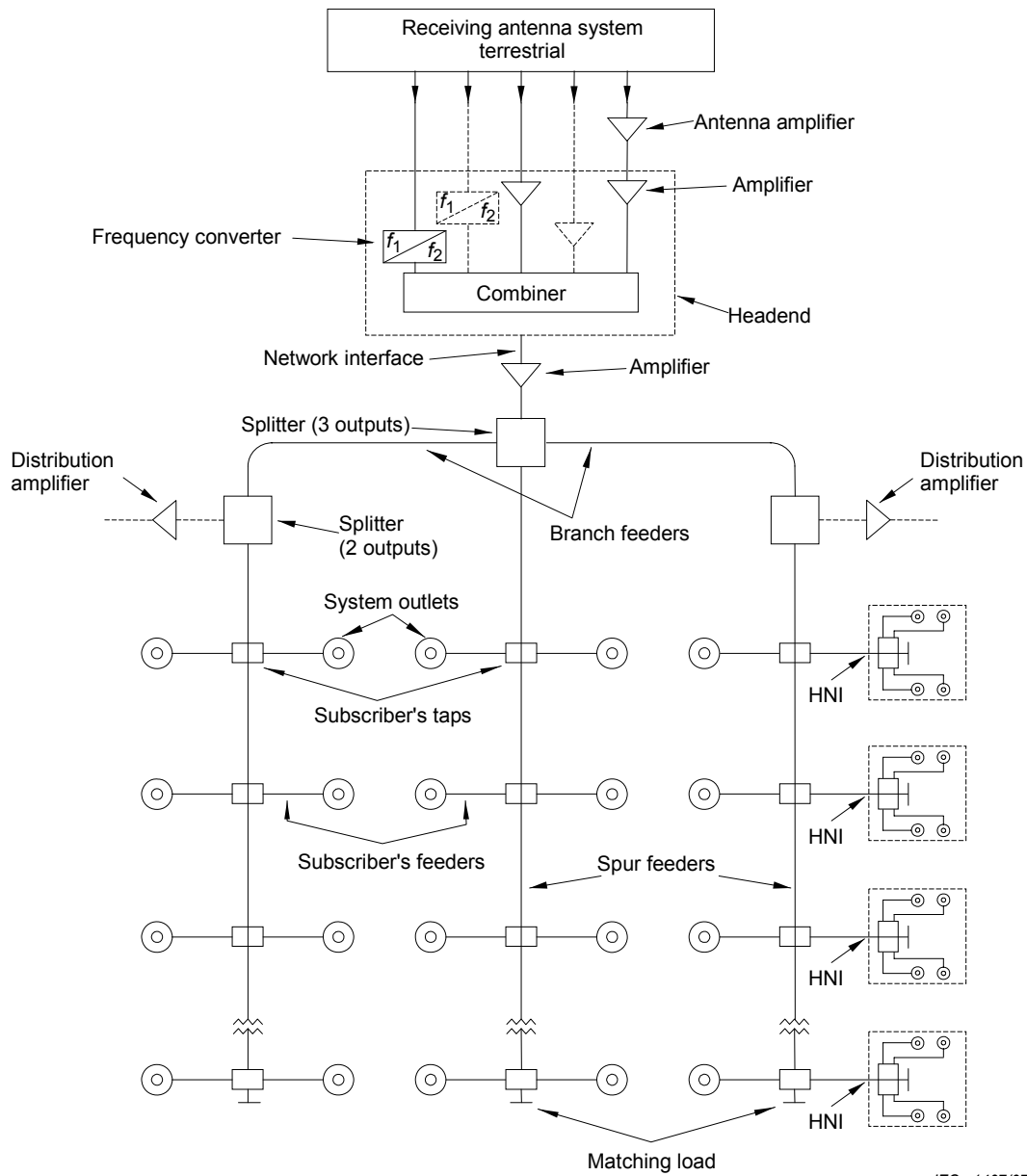
The installation of an outdoor antenna for each TV receiver should be avoided for several obvious technical, economical and practical reasons.

In a building divided into apartment blocks, the installation of a master antenna television system for terrestrial (MATV) and/or satellite (SMATV) reception, as shown in Figures 1, 2, 3, 4 and 5, describing as an example the various parts of the system is usual. Most of the terms used in the IEC 60728 series can be referred to these figures.

When signals to be conveyed to the TV receivers are picked up far away, for geographical reasons, and the number of users (subscribers) is very high, the installation of a cable network using coaxial cables and/or fibre optic cables is used, as indicated in Figure 4, describing as an example the various parts of the system.

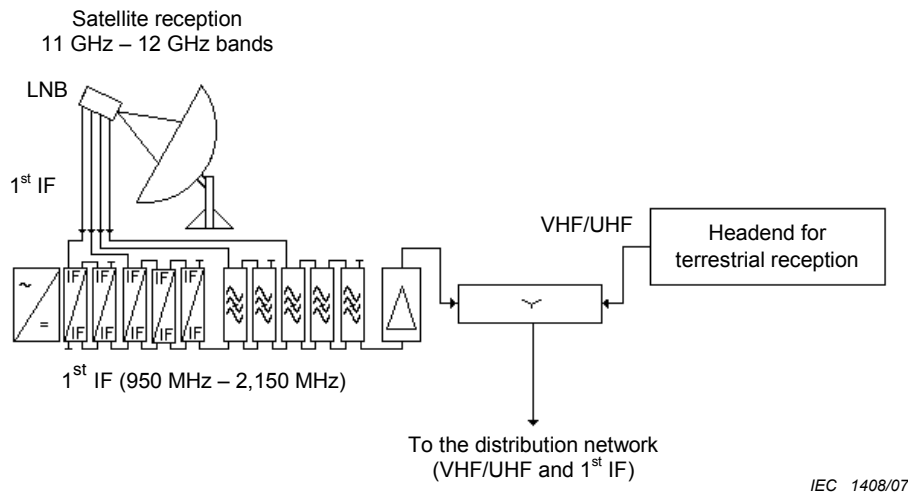
A system model of a cable network is shown in Figure 5, where the main parts of the systems are indicated, as defined in Clause 3.

¹ This word encompasses the HFC networks used nowadays to provide telecommunications services, voice, data, audio and video both broadcast and narrowcast.



Some apartments (dwelling units) are served with a home network (HN), interfaced to the MATV system by the Home Network Interface (HNI).

Figure 1 – Example of a master antenna television system (MATV) for terrestrial reception



NOTE Distribution at the 1st IF on the same cable as terrestrial VHF/UHF channels.

Figure 2 – Example of the headend of a master antenna television system for satellite (SMATV) reception

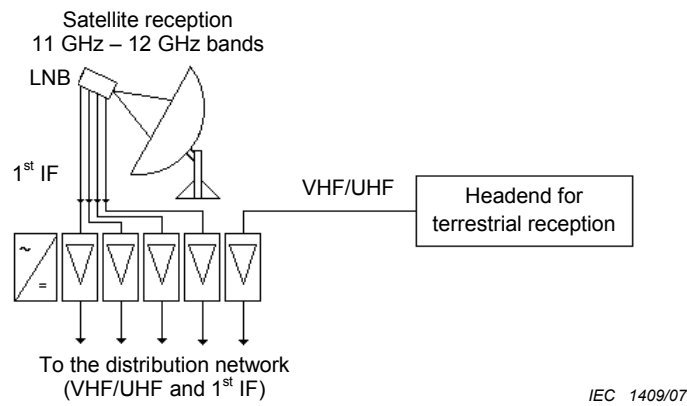


Figure 3a – Headend for terrestrial and satellite reception using multicable distribution

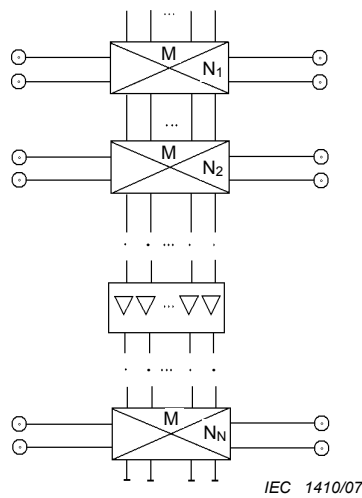


Figure 3b – Distribution with switching matrix at each flat

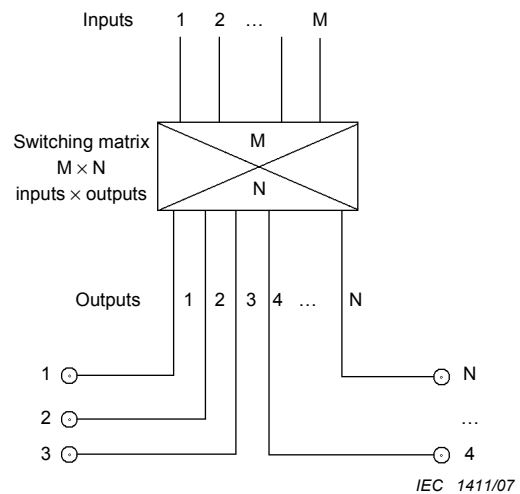
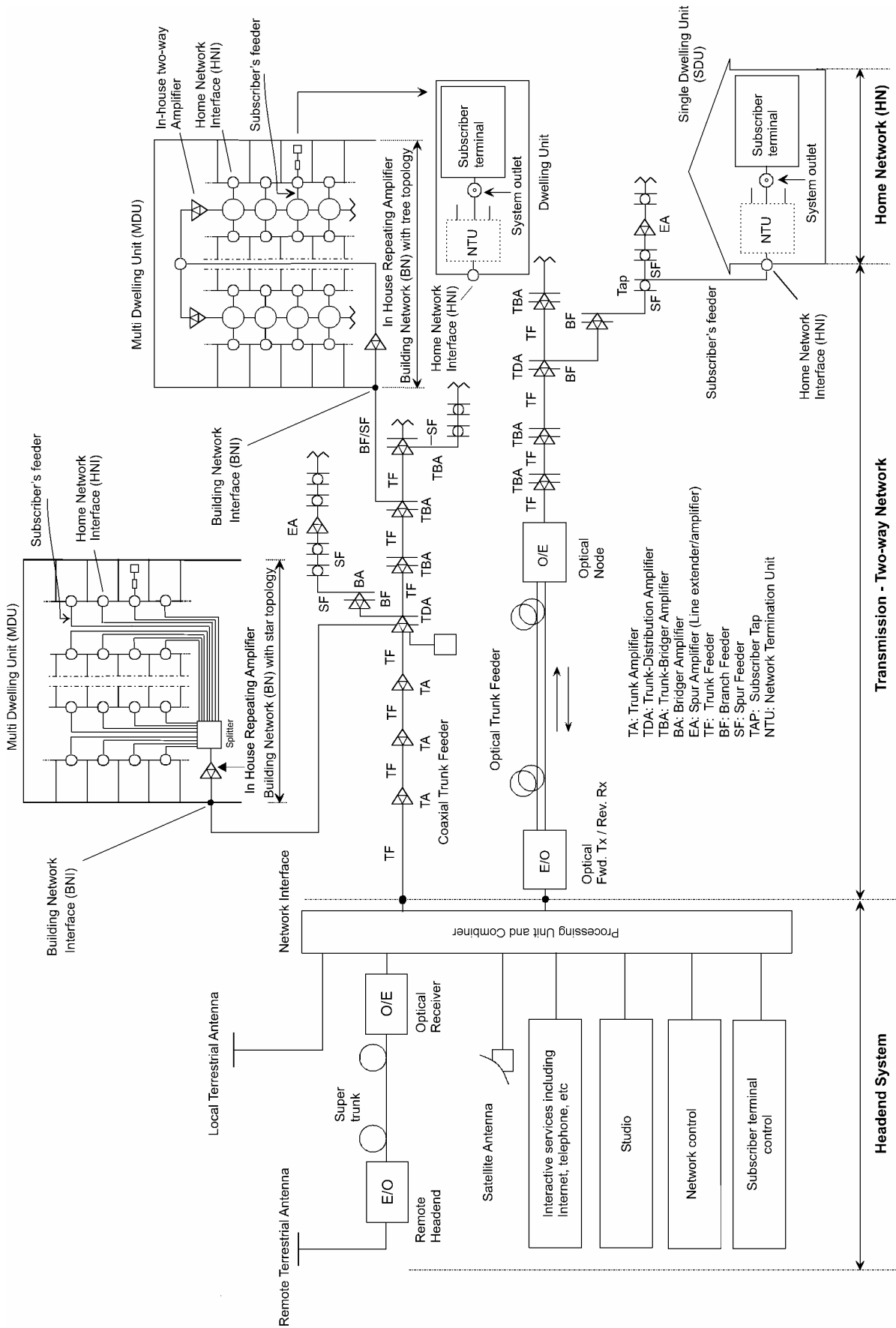


Figure 3c – Distribution with switching matrix: star configuration

NOTE Distribution at the 1st IF using multicable and multi-switch technique.

Figure 3 – Example of a master antenna television system for terrestrial and satellite (SMATV) reception



IEC 1412/07

Figure 4 – Example of a cabled distribution system for television and sound signals

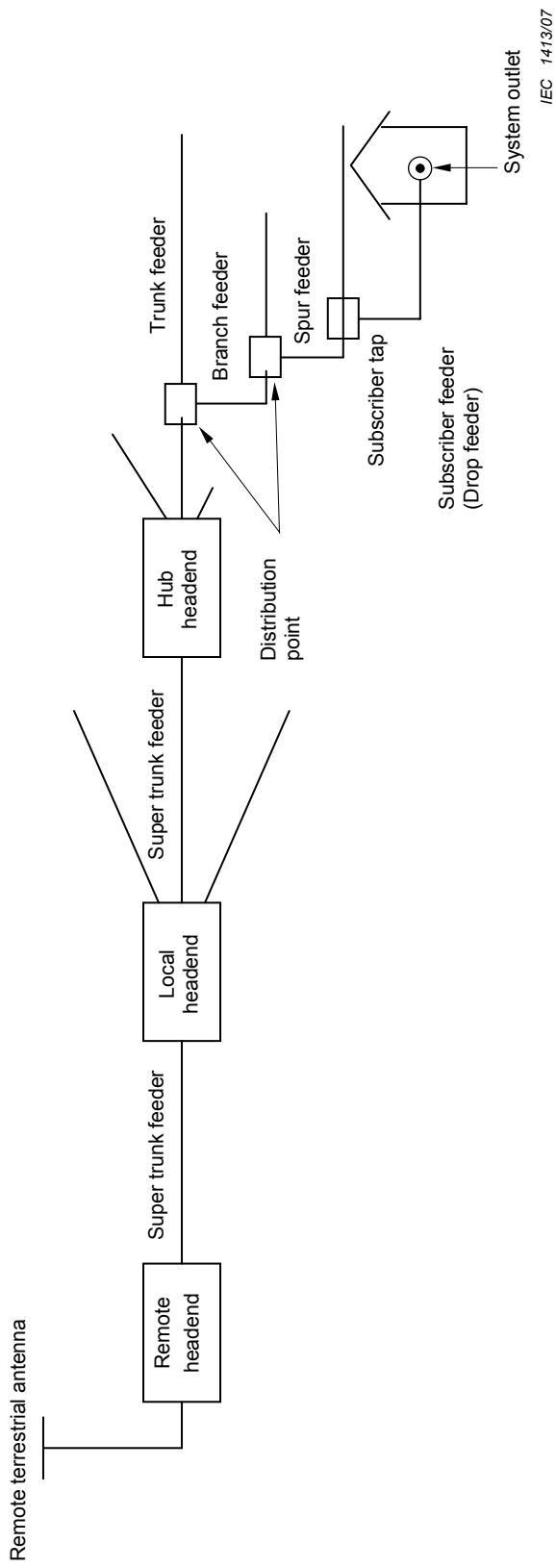


Figure 5 – System model for downstream direction of a cable network for television and sound signals (CATV)

CABLE NETWORKS FOR TELEVISION SIGNALS, SOUND SIGNALS AND INTERACTIVE SERVICES –

Part 1: System performance of forward paths

1 Scope

This part of IEC 60728 is applicable to any cable network (including individual receiving systems) having in the forward path a coaxial cable output and primarily intended for television and sound signals operating between about 30 MHz and 3 000 MHz.

This standard specifies the basic methods of measurement of the operational characteristics of cable network having coaxial cable outputs in order to assess the performance of these systems and their performance limits.

All requirements refer to the performance limits, which shall be obtained between the input(s) to the headend or headends and any system outlet when terminated in a resistance equal to the nominal load impedance of the system, unless otherwise specified. Where system outlets are not used, the above applies at the subscriber's end of the subscriber's feeder. Also the requirements which are obtained between the input(s) to the headend or headends and any home network interface (HNI) are given.

NOTE 1 Methods of measurement described in this standard are considered as basic. However, any equivalent method that ensures at least the same accuracy may be used.

NOTE 2 If the system operator wishes to subdivide the system into a number of parts or wishes to use different transmission media (for example, coaxial cabling, balanced cabling, optical cabling), the accumulation of degradations should not exceed the figures given in this standard.

NOTE 3 System performance requirements of return paths as well as specific methods of measurement for the use of the return paths in cable networks are described in IEC 60728-10.

Clause 5 defines the system performance limits which will, with an unimpaired input, (headend input signal), produce picture and sound signals (at system outlets) where the impairment to any single parameter will be not worse, in normal operating conditions for any analogue channel, than Grade four on the five-grade impairment scale contained in ITU-BT 500-10. For digitally modulated signals, the quality requirement is a quasi-error-free (QEF) reception.

Appropriate performance requirements for the signals at the receiving antennas site are given in Clause 6 in order to provide at the input of the headend of the cable network both analogue and digital television signals with suitable quality.

Clause 7 is applicable to home networks (including those of individual receiving systems) using coaxial cables, balanced cables or optical cables and primarily intended for television signals, sound signals and interactive services, operating between about 30 MHz and 3 000 MHz.

This clause, considering the basic operational characteristics of a home network, specifies the requirements which shall be obtained at the home network interface (HNI) taking into account the performance requirements given at the system outlet or at the terminal input.

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.

IEC 60050-705, *International Electrotechnical Vocabulary (IEV) – Chapter 705: Radio wave propagation*

IEC 60050-712, *International Electrotechnical Vocabulary (IEV) – Chapter 712: Antennas*

IEC 60050-713, *International Electrotechnical Vocabulary (IEV) – Part 713: Radiocommunications: transmitters, receivers, networks and operation*

IEC 60050-725, *International Electrotechnical Vocabulary (IEV) – Chapter 725: Space radiocommunications*

IEC 60617, *Graphical symbols for diagrams*

IEC 60728-2, *Cabled distribution systems for television and sound signals – Part 2: Electromagnetic compatibility for equipment*

IEC 60728-3, *Cable networks for television signals, sound signals and interactive services – Part 3: Active wideband equipment for coaxial cable networks*

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

IEC 60728-10, *Cable networks for television signals, sound signals and interactive services – Part 10: System performance of return paths*

IEC 60728-11, *Cable networks for television signals, sound signals and interactive services – Part 11: Safety*

IEC 60728-12, *Cabled distribution systems for television and sound signals – Part 12: Electromagnetic compatibility of systems*

IEC 60966-2-4, *Radio frequency and coaxial cable assemblies – Part 2-4: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 3 000 MHz, IEC 61169-2 connectors*

IEC 60966-2-5, *Radio frequency and coaxial cable assemblies – Part 2-5: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 1 000 MHz, IEC 61169-2 connectors*

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