BS EN 62087-5:2016

BSI Standards Publication

Audio, video and related equipment — Determination of power consumption

Part 5: Set top boxes (STB)

bsi.

National foreword

This British Standard is the UK implementation of EN 62087-5:2016. It is identical to IEC 62087-5:2015. Together with BS EN 62087-1:2016, BS EN 62087-2, BS EN 62087-3:2016, BS EN 62087-4:2016 and BS EN 62087-6:2015 it supersedes BS EN 62087:2012 which will be withdrawn on 19 February 2019.

The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Appareils audio, vidéo et matériel connexe - Détermination de la consommation de puissance - Partie 5: Boîtiers décodeurs (IEC 62087-5:2015)

Messverfahren für die Leistungsaufnahme von Audio-, Video- und verwandten Geräten - Teil 5: Set-Top-Boxen (IEC 62087-5:2015)

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Comité Européen de Normalisation Electrotechnique
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European foreword

The text of document 100/2470/FDIS, future edition 1 of IEC 62087-5, prepared by Technical Area 12 “AV energy efficiency and smart grid applications” of IEC/TC 100 “Audio, video and multimedia systems and equipment” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62087-5:2016.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-08-19
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This document supersedes EN 62087:2012 (partially).

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61938:2013	NOTE	Harmonized as EN 61938:2013 (not modified).
IEC 62087 Series	NOTE	Harmonized as EN 62087 Series.
IEC 62087-2:2015	NOTE	Harmonized as EN 62087-2:2015 (not modified).
IEC 62542:2013	NOTE	Harmonized as EN 62542:2013 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60107-1	1997	Methods of measurement on receivers for television broadcast transmissions - Part 1: General considerations - Measurements at radio and video frequencies	EN 60107-1	1997
IEC 62087-1	2015	Audio, video, and related equipment - Determination of power consumption - Part 1: General	EN 62087-1	2016
IEC 62216	2009	Digital terrestrial television receivers for the DVB-T system	EN 62216	2011

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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AUDIO, VIDEO AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 5: Set top boxes (STB)

FOREWORD

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International Standard IEC 62087-5 has been prepared by technical area 12: AV energy efficiency and smart grid applications, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This first edition of IEC 62087-5 cancels and replaces Clause 8 of IEC 62087:2011. This standard together with IEC 62087-1 to IEC 62087-4 and IEC 62087-6 cancels and replaces IEC 62087:2011. This International Standard constitutes a technical revision.

This edition does not include any significant technical changes with respect to Clause 8 of IEC 62087:2011. It was developed as a member of the new multipart series of IEC 62087 standards.

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

FDIS	Report on voting
100/2470/FDIS	100/2500/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.

A list of all parts in the IEC 62087 series, published under the general title *Audio, video, and related equipment – Determination of power consumption*, can be found on the IEC website.

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 website 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

This part of IEC 62087 specifies methods for measurement of the power consumption of set top boxes for consumer use.

IEC 62087:2011[1] (third edition) revises methods for measuring power consumption of set top boxes in the On mode and Partial On modes. These modes correspond to the active modes which are defined in IEC 62542:2013.

This standard has been divided into multiple parts. At the time of publication of this part, the following parts are planned or published:

– Part 1: General
– Part 2: Signals and media
– Part 3: Television sets
– Part 4: Video recording equipment
– Part 5: Set top boxes (STB)
– Part 6: Audio equipment

[1] IEC 62087:2011, *Methods of measurement for the power consumption of audio, video and related equipment*

AUDIO, VIDEO AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 5: Set top boxes (STB)

1 Scope

This part of IEC 62087 specifies methods of measurement for the power consumption of set top boxes (STBs). It specifies the different modes of operation which are relevant for measuring power consumption.

The methods of measurement are applicable only for equipment which can be connected to the mains.

The measuring conditions in this standard represent the normal use of the equipment and may differ from specific conditions, as specified, for example, in safety standards.

2 Normative references

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

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General conditions – Measurements at radio and video frequencies*

IEC 62087-1:2015, *Audio, video, and related equipment – Methods of measurement for power consumption – Part 1: General*

IEC 62216:2009, *Digital terrestrial television receivers for the DVB-T system*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1
additional functions
functions that are not required for the basic operation of the equipment

3.1.2
buffering
temporary storage of video and audio streams in some form of memory in order to perform time shifting functions

3.1.3
cable TV STB
STB whose principal function is to receive and decode television signals from a broadband, hybrid fiber/coaxial, community cable distribution system and deliver them to a display and/or recording device

3.1.4
conditional access module
plug-in module that enables conditional access

3.1.5
data over the cable service interface specification
DOCSIS
international suite of standards that define interface requirements for cable modems involved in high-speed data and video/audio content distribution over cable television systems

3.1.6
internet protocol TV STB
STB whose principal function is to receive and decode television/video signals encapsulated in IP packets and to deliver them to a display and/or recording device

3.1.7
multi-room STB
STB that is capable of providing 2 or more independent video and audio streams either direct to display devices or to thin clients/remote

3.1.8
satellite TV STB
STB whose principal function is to receive and decode television signals from satellites and deliver them to a display and/or recording device

3.1.9
set top box
STB
equipment for the reception of television and related services (e.g. radio) from terrestrial, cable, satellite, or broadband networks which are decoded and delivered to a display and/or recording device

3.1.10
special functions
functions that are related to, but not required for, the basic operation of the device

3.1.11
television set
TV
equipment for the reception and display of television broadcast and similar services for terrestrial, cable, satellite and broadband network transmission of analogue and/or digital signals

Note 1 to entry: A television set may include additional functions that are not required for its basic operation.

3.1.12
terrestrial TV STB
STB whose principal function is to receive and decode television signals over the air (OTA) and deliver them to a display and/or recording device

3.1.13
thin-client STB
remote STB
STB that is designed to interface between a multi-room capable STB and a TV (or other output device) that has no ability to interface with the service provider directly and relies solely on a multi-room box STB for content

Note 1 to entry: Any STB that meets the definition of cable TV, satellite TV, Internet protocol TV or terrestrial TV STB is not a thin-client/remote STB.

3.1.14
time shifting
capability of a device to allow playback type functions with real time broadcast

Note 1 to entry: Such functions may include fast forward, review (rewind), pause and slow motion.

3.1.15
video recording equipment
equipment for the recording and reproduction of video and audio signals on a recording medium

EXAMPLES Video cassette recorder (VCR) and digital versatile disc (DVD) player or recorder.

Note 1 to entry: Equipment with only playback function is included as well.

3.2 Abbreviations

′	Prime
AC	Alternating Current
BD	Blu-ray Disc TM[2]
DC	Direct Current
DVD	Digital Versatile Disc
IP	Internet Protocol
HD	High Definition (720 p or better)
HDD	Hard Disk Drive
LNB	Low Noise Block converter
MPEG	Moving Picture Experts Group
OTA	Signals Over the Air
RF	Radio Frequency
SD	Standard Definition
STB	Set Top Box
UUT	Unit Under Test
VCR	Video Cassette Recorder

4 Specification of operating modes and functions

4.1 General

Table 1 contains the operating modes and functions for set top boxes.

4.2 Auto power down function

An auto power down feature may be implemented on a STB to power down into a Partial On mode after a predetermined time. Such a feature should be referred to as auto power down.

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2 Blu-ray Disc™ is a trade mark of the Blu-ray Disc Association. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named.

Table 1 – Operating modes and functions

Power	Mode	Sub-mode	Function(s)	Description
0 W	Disconnected	Disconnected	Disconnect	The equipment is disconnected from all external power sources.
≥0 W	Off	Off	Off	The equipment is connected to an external power source and provides no functions that depend on a power source. The equipment cannot be switched into any other mode with the remote control unit, or an external or internal signal. Note that some power may be consumed if an EMC filter or other components exist on the source side of the power switch.
>0 W	Partial On	Standby-passive	– Wake on – remote control – internal signal	The equipment is connected to an external power source and does not provide its primary functions. The equipment can be switched into another mode with the remote control unit or an internal signal, but not with an external signal.
		Standby-active, low	– Wake on – remote control – internal signal – external signal	The equipment is connected to an external power source and does not provide its primary functions. The equipment can be switched into another mode with the remote control unit, an internal signal, or an external signal.
		Standby-active, high	– Wake on – remote control – internal signal – external signal – Data communications	The equipment is connected to an external power source and does not provide its primary functions. The equipment can be switched into another mode with the remote control unit, an internal signal, or an external signal. Additionally, the equipment is exchanging/ receiving data with/from an external source.
	On	On-play	Playing a programme from an HDD, solid state memory, or other media	The equipment is connected to a power source and plays the tape. The optical disc inside the equipment.
		On-broadcast	Pictures and sound from a broadcast	The equipment is performing the function of providing a viewer with video and audio from a broadcast.
		On-record	Recording a programme from a broadcast	The equipment is connected to a power source and records a signal from an external or internal source.
		On-multifunction	Recording Playing back	The equipment is performing multifunction “On-play” and/or “On-record” simultaneously.

5 Measuring conditions for set top boxes (STBs)

5.1 Overview of a set top box

STBs are devices that perform the task of providing audio, video and related services from various broadcast, narrowcast and broadband platforms. They can exist as stand alone devices or as an integral part of a network. Although originally they were analogue in nature more recently, STBs are typically associated with digital television services.

Recent STBs have included various enhanced functionality such as recording. The measuring method described in this clause only covers STBs that have either HDDs or solid state memory for recording. In the case of solid state memory this method covers the STB whether or not the memory is removable. STBs with removable media, apart from solid state memory, are not covered by this method.

5.2 Input signal

5.2.1 General

In general terms, input signals shall be of the strength and quality for the type of broadcast system on which the STB is intended to be used. Where an STB supports multiple broadcast systems, it shall be tested for each broadcast system in which it operates. Each measured result shall be described in the report. In some circumstances, the dynamic broadcast-content video may be suitable for use as the video and audio test signal content but will need to be multiplexed and modulated as stated in 5.2.2 below.

5.2.2 RF test signal

5.2.2.1 General

For digital terrestrial, satellite and cable TV STBs, the test signal shall be comprised of a multiplexed transport stream modulated with parameters that reflect the typical environment in which the STB will be used. The video and audio components of the transport stream shall be as described in 5.2.2.2 and 5.2.2.3. For analogue terrestrial TV, satellite TV and cable TV STBs, the signal should be typical of the type of signal the STB is designed to receive.

5.2.2.2 Video test signal

The STB shall be tested using an appropriate input signal. This input signal should be at the highest resolution that the STB is capable of decoding using the most processing intensive advanced decoding standard of the intended broadcast system(s) that the STB will be used on. A description of the signal used for the test shall be included in the test report. This description shall include at a minimum, resolution, frame rate and bit rate.

If the STB under test is an HD decoder, additional testing may also be conducted with an SD input signal.

Where the STB is operating in a download or recording mode, the input should contain content that simulates material that would typically be downloaded or recorded.

Where an STB has a conditional access system, it should be tested whilst decoding encrypted content.

Where an STB can record other services than the one being watched, the test signal should contain sufficient services to enable this feature to be tested.

5.2.2.3 Audio test signal

The STB shall be tested using an appropriate input signal. The audio test signal should have the maximum data rate (bit/s).

The audio format used during the power measurement shall be described in the report.

5.2.3 Broadband input signal

An input signal that provides the equivalent multiplexed transport stream as an appropriate internet protocol (IP) broadband signal conforming to the defined video and audio test signalling (5.2.2.2 and 5.2.2.3).

5.3 Input terminals

5.3.1 Analogue terrestrial input terminal

In the case that the STB is being tested with an analogue terrestrial RF input signal, the signals used shall conform to IEC 60107-1:1997, 3.3, and shall have the input signal level set at –39 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a perceptually noise free and error free picture.

NOTE –39 dB(mW) corresponds to 70 dB(μV).

5.3.2 Cable television input terminal

In the case that the STB is being tested with a cable television RF input signal, the signals used shall conform to the cable television specifications for the region, and shall have the input signal level set at –49 dB(mW) with a termination of 75 Ω resistor or at a level to provide better than the picture failure point (PF) as defined in IEC 62216:2009 for digital signals or a perceptually noise free and error free picture or error free for analogue signals.

NOTE –49 dB(mW) corresponds to 60 dB(μV).

5.3.3 Digital terrestrial input terminal

In the case that the STB is being tested with a digital terrestrial RF input signal, the signals used shall conform to the broadcast specifications for the region, and shall have the input signal level set at –49 dB(mW) with a termination of 75 Ω resistor or at a level to provide better than the picture failure point (PF) as defined in IEC 62216:2009 or a perceptually noise free and error free picture.

5.3.4 Satellite input terminal

In the case that the STB is being tested with a satellite input signal, the input signal level shall be set at –49 dB(mW) with a termination of 75 Ω resistor or at a level to provide better than the picture failure point (PF) as defined in IEC 62216:2009 for digital signals or a perceptually noise free picture or error free for analogue signals.

5.4 Measurement procedure

5.4.1 General measuring conditions

The general measuring conditions including the type of power meters to be used is as per IEC 62087-1:2015 except where conditions are otherwise specified in this subclause.

5.4.2 Stabilization

The measurements shall be performed after the STB has achieved a stable condition with respect to power consumption. Refer also to IEC 62087-1:2015.

NOTE There are several ways to consider a STB stable. For example, a STB can be considered stable between 15 min and 30 min after entering into each operation mode. In this case, the time used to stabilize the STB shall be recorded in the test report. A STB can be also considered stable when any of the results of the same test repeated are within 2 %.

5.4.3 Environmental conditions

The ambient temperature shall be 23 °C ± 5 °C. Refer also to IEC 62087-1:2015.

5.4.4 Setup

The STB shall be set up in a manner to simulate a normal operating environment. In this condition, the measurement shall be made without optional peripheral devices attached to the

device. The input signals to the STBs may be either live signals or generated test streams that simulate live signals that the STB is designed to receive and decode.

Where a STB can power an LNB of an antenna amplifier this power shall not be included in the measurement. Where possible, this power supply should be disabled. Where it cannot be disabled isolation connectors should be used to isolate the power supply.

If required the LNB or antenna amplifier should be powered from an external power source to the STB.

If possible, any function which may work in background of any On mode function should be disabled (turned off). If possible, any function which may cause the interruption of any On mode function should also be disabled (turned off). If they cannot be disabled the measurement should be scheduled so as to avoid working such background functions during the measurement.

NOTE Examples of background and/or interrupt functions for any On mode function are:

– background software download/install;
– timer recording;
– automatic deletion of an old TV programme which was recorded.

5.4.5 Power measurements

5.4.5.1 General

The STB under test shall be measured in each applicable mode as specified below. In the case of HD STBs, testing shall be with an HD input signal. Testing with an SD input signal may also be conducted. Where the SD test is conducted on an HD STB, the result shall be recorded as $P_{AV\_ON\_SD}$.

5.4.5.2 On-broadcast

Disable the time shifting function, if possible, and measure the average power consumed for 2 min. Record this as P_{AV_ON}. Record the time used to measure the average power.

5.4.5.3 On-play

Start a playback of a previously recorded programme on the STB and measure the average power consumed for a two minute period. Record this as P_{PL}.

5.4.5.4 On-record

Start or schedule a recording. With the STB recording the programme, measure the average power consumed for a two minute period. Record this as P_{REC_ON}.

5.4.5.5 On-multifunction with a single tuner

Set the STB to record a programme while simultaneously playing back a previously recorded programme and measure the average power consumed for 2 min. Record this as P_{MF_ST}. Time shifting is covered in this measurement as this is the case when the STB is playing back the same programme as it is recording.

NOTE The mechanism for multifunction with a single tuner is the same as for time shift or recording. For this reason there is no need to measure time shifting and recording separately. See Annex A.

5.4.5.6 On-multifunction with a multi tuner

Table 2 shows the matrix that shall be used to characterize a multituner STB.

Table 2 – Matrix for multituner STBs

	Tuner	Viewing	Add 2nd tuner recording HD or SD	Add 3rd tuner recording HD or SD[a]	Add 4th tuner recording HD or SD[a]	Add *n*th tuner recording HD or SD[a]
Sequence 1	$P_{MFA\_SD\_n}$	SD	$P_{MFA\_SD\_2}$	$P_{MFA\_SD\_3}$	$P_{MFA\_SD\_4}$	$P_{MFA\_SD\_n}$
Sequence 2	$P_{MFA\_HD\_n}$	HD	$P_{MFA\_HD\_2}$	$P_{MFA\_HD\_3}$	$P_{MFA\_HD\_4}$	$P_{MFA\_HD\_n}$
[a] If fitted.						

Measure the average power for 2 min for each of the modes in the matrix.

For SD STBs, only sequence 1 shall be performed. For HD STBs, both sequence 1 and sequence 2 shall be performed.

5.4.5.7 Standby-active, high

If possible, activate a download mode from the primary service and measure the average power consumed for at least 2 min. This measurement may require information from the manufacturer and/or service provider to ensure the transport stream contains a suitable download and instructions on how to set the STB to receive the download. Record this value as P_{SAH} and record the time used to measure the average power.

NOTE It may not be possible to place the STB into this mode. If this is the case and the value is still required it may have to be provided by manufacturer's declaration.

5.4.5.8 Standby-active, low

To ensure that the STB is in standby-active and not performing any downloading or recording function, the following procedure should be used.

a) Put the STB into its on mode.
b) If the STB is capable of scheduling a recording then schedule a recording 2 or more hours in the future.
c) After 5 min in this mode, press the standby or off button on the remote control.
d) Leave the STB for a minimum of 30 min or until higher power mode maintenance activities within the UUT have been completed.

Measure the average power consumed for at least 2 min. Record this as P_{SAL}. Record the time used to measure the average power. Record the time taken to switch to standby-active, low.

5.4.5.9 Standby-passive

To ensure that the STB is in standby-passive, the following procedure should be used.

a) Put the STB into its on mode.
b) If the STB is capable of scheduling a recording then schedule a recording 2 or more hours in the future.
c) After 5 min in this mode, press the standby or off button on the remote control.
d) Leave the STB for a minimum of 30 min or until higher power mode maintenance activities within the UUT activities have been completed.

Measure the average power consumed for at least 2 min. Record this as P_{SP}. Record the time used to measure the average power. Record the time taken to switch to standby-passive.

NOTE The method for determining standby-active low and standby-passive are identical as the switching into either one of these modes is the same. Which mode the STB actually switches to is determined by the platform in which the STB is operating. A terrestrial TV STB will be more likely to be in a passive mode and a cable or satellite TV STB will be more likely to be in a standby-active low mode. Both methods are specified here to be consistent with the definitions in Table 1.

5.4.5.10 Off

Turn the STB off using the power switch, if available, and measure the average power consumed for at least 2 min. Record this as $P_{\_OFF}$ and record the time used to measure the average power

5.4.5.11 Auto power down

If the UUT includes an auto power down feature, use the following procedure to determine the auto power down interval and the power consumption after auto power down is completed. (See Figure 1.)

a) Place the UUT in the On mode with the auto power down function enabled. The auto power down interval is specified by the manufacturer. The auto power down interval should be reported.

b) Stop any main functions of the UUT and start a timer to determine the auto power down interval.

c) Allow the UUT to automatically power down.

d) Monitor the power consumption of the UUT until the power consumption stabilizes.

e) Stop the timer and report the auto power down interval.

f) Measure the average power consumed for 2 min. Record this as P_{APD}.

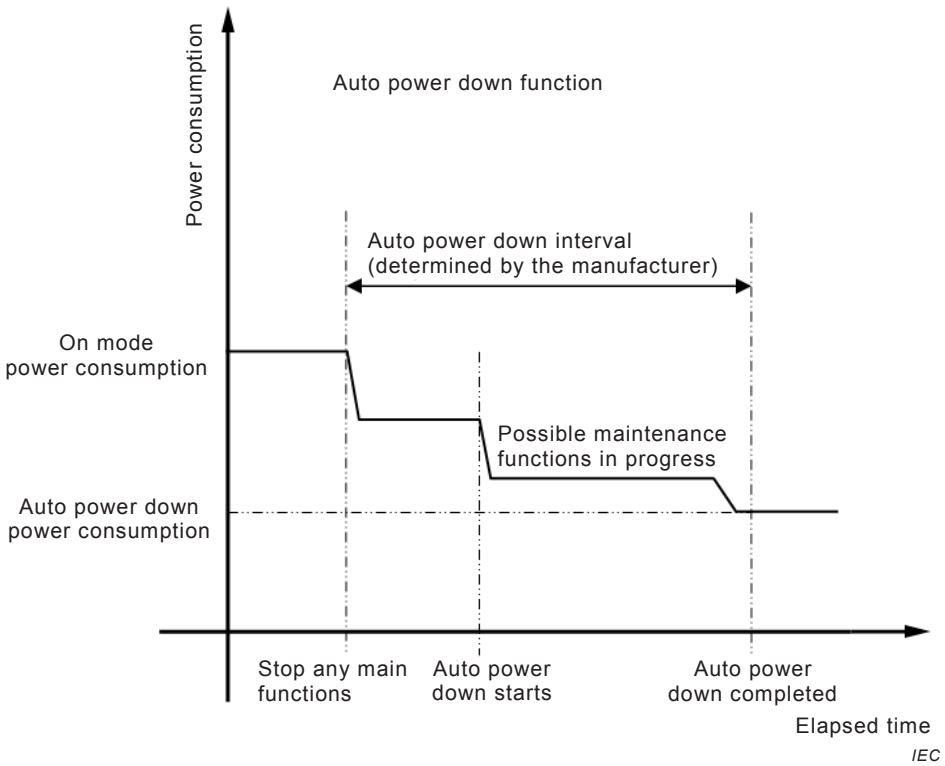

Figure 1 – Auto power down function

Annex A
(informative)

General information on STB technology

A.1 General

This annex covers a number of technology and testing issues that may be helpful as additional information to that which is contained in Clause 5. Figure A.1 shows a block diagram of the common functional parts of an STB.

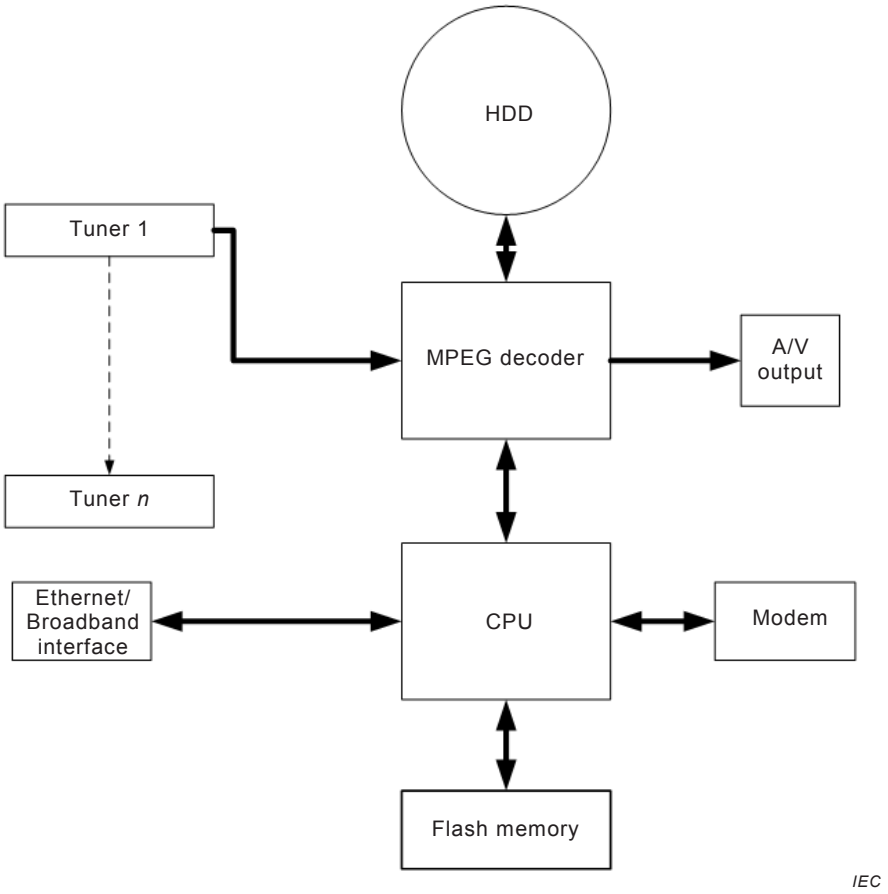

Figure A.1 – Block diagram of the common functional parts of an STB

A.2 Background on STB technology

STB technology was originally introduced to receive subscription based TV services and display the content on televisions. The original services were analogue. However, as digital broadcast technology has been introduced over the last several years STBs have become a rapidly developing technology for both subscription and free to air terrestrial, cable and satellite TV services. Most recently STBs have been developed for Internet protocol TV services.

The range of types now available vary from simple adaptors for terrestrial free to air TV services to complex multituner types with recording and time slip functions. STBs are now emerging with removable and non removable solid state memory.

Due to the rapid rise in STB use, concerns have been raised about the increased energy consumption by these devices and actions in the form of a number of programmes both voluntary and regulatory have been implemented.

In IEC 62087:2011 STB measurement methods were revised in response to both the changed nature of STBs and the need for internationally accepted methods of measurement to facilitate the development of energy efficiency programmes associated with STBs. STBs covered by IEC 62087:2011 include STBs with recording capability using non removable media such as HDDs or solid state memory. It also includes recording capability on removable solid state memory. DVD recorders and Blu-ray Disc™ (BD) recorders are excluded from the scope of this standard.

The measuring method covers both so called simple STBs and also complex STBs. The distinction between these types of STBs is whether conditional access is deployed in the STB. The power measurement methods in this standard apply to both types of STBs.

From the perspective of power measurement, Figure A.1 shows the relevant functional contributors to power consumption for an STB.

A.3 Testing recording and time shift functions

Figure A.2 and Figure A.3 show the data flow for a single tuner time shift function and for multifunction record and playback.

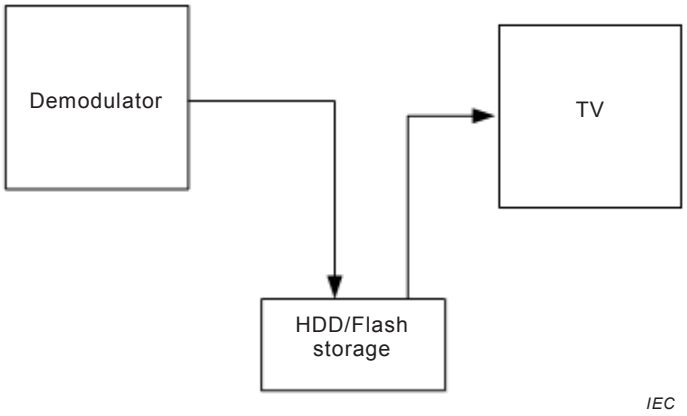

Figure A.2 – Time shift recording with single tuner

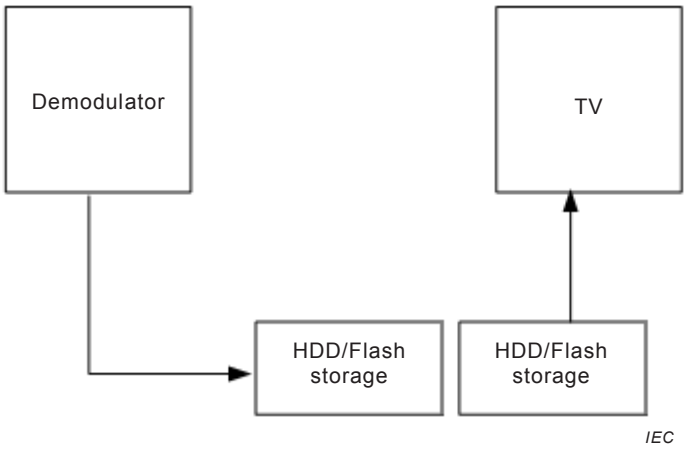

Figure A.3 – Single tuner multifunction record and playback

The diagrams show that essentially it is the same data flow. In the multifunction case, one programme is being recorded and a second is being played back. These programmes exist on different parts of the recording media. This is no different than the time shift case. Although it is only one programme, the physical location of the data being recorded will be different from the data being played back as a time shift. For this reason, this standard only requires the measurement of the multifunction mode for a single tuner.

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