



**RECEIVERSPECIFICATIONREQUIREMENTS FOR  
DIGITAL TERRESTRIAL INTEGRATED DIGITAL  
TELEVISION (iDTV)**

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## 1. Introduction

### 1.1. Proposition

This document describes a baseline profile, based on open standards for a high definition integrated digital television receivers for the reception of digital terrestrial television signals.

In this profile items are marked as ‘Required’ and ‘Optional’. All items marked as ‘**Mandatory**’ must be included to achieve minimum compliance with this specification. Items marked as ‘**Optional**’ may be included by vendors to enhance the offering to the consumer.

This specification is not a comprehensive list of all relevant standards relating to consumer equipment that can provide terrestrial digital television reception but rather a list of those standards considered relevant to the requirements.

This profile is based predominantly on Digital Video Broadcasting (DVB) standards. Additions and changes have been made to suit the requirements for a digital terrestrial receiver

### 1.2. Purpose

The purpose of this document is to describe the requirements for a terrestrial digital television receiver. The intention of this document is to also refer to other detailed specifications that need to be adhered to produce a conformant digital television receiver. The profile is a hardware specification outline together with a software requirements overview.

### 1.3. Scope

This document identifies the minimum required specification for an Integrated Digital Television (iDTV) for the reception of digital terrestrial television signals in Kenya.

## 2. Abbreviations

CAM	Conditional Access Module
C/N	Carrier to Noise Ratio
COFDM	Coded Orthogonal Frequency Division Multiplexing
dB	Decibel

DTV	Digital Television
DVB	Digital Video Broadcast
EMC	Electromagnetic Compatibility
EPG	Electronic Program Guide
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute.
FEF	Future Extension Frame
FFT	Fast Fourier Transmission
HD	High Definition
HDMI	High-Definition Multimedia Interface
HDTV	High Definition Television
IEC	International Electro technical Commission
iDTV	Integrated Digital Television
ISO	International Standards Organization
ITU-R	International Telecommunications Union – Radio communication
LCN	Logical Channel Number
MHEG-5	Multimedia and Hypermedia Experts Group-5
MPEG-2	Moving Picture Expert Group -2
NIT	Network Information Table
OAD	Over the Air Download
OSD	On Screen Display
PLP	Packet Layer Protocol
PP	Pilot Patterns
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RCA	Radio Corporation of America
SDTV	Standard Definition Television

SFN	Single Frequency Network
SI	Service Information
S/PDIF	Sony/Philips Digital Interface Format
TDT	Time and Date Table
TFS	Time Frame Slicing
TOT	Time Offset Table
UHF	Ultra High Frequency
VHF	Very High Frequency
µs	Microsecond

### 3. References

EN 300 468 V1.11.1	Digital Video Broadcasting (DVB) Digital Broadcasting Systems for Television, Sound, and Data Services. Specification for service information (SI) in Digital Video Broadcasting (DVB) European Telecommunication Standards Institute ETSI
TR 101 190 v.1.2.1	Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial Transmission aspects.
EN 300 744 v.1.6.1	Digital Video Broadcasting (DVB); DVB Framing structure, Channel coding and modulation for digital terrestrial television. European Telecommunications Standards Institute. ETSI.
TR 101 211 V1.11.1	Digital Video Broadcasting (DVB); guidelines on implementation and usage of Service information (SI)
EN 300 472 v1.3.1	Digital Video Broadcasting (DVB) Digital Broadcasting Systems for Television, Sound, and Data Services. Specification for conveying ITU-R system B Teletext in Digital Video Broadcasting (DVB) Bit streams. European Telecommunication Standards Institute ETSI.
TR 101 190 v.1.2.1	Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial Transmission aspects.
EN 300 744 v.1.6.1	Digital Video Broadcasting (DVB); DVB Framing structure, Channel coding and modulation for digital terrestrial television. European Telecommunications Standards Institute. ETSI.
ETR 101 154 v1.7.1	Digital Video Broadcasting (DVB); Implementation Guidelines for the use of video and audio coding in Broadcasting Applications based on the MPEG-2 transport stream
ETSI 162	Digital Broadcasting Systems for Television, sound and data services, allocation of service information (SI) codes for digital Video Broadcasting (DVB) systems. European Telecommunication Standards Institute. ETSI.
ETSI 300 743 v1.3.1	Digital Video Broadcasting (DVB); DVB Subtitling Systems. European Telecommunication Standards Institute. ETSI.
ISO/IEC 14496-10 2005	Information Technology – Coding of audio visual objects – part 10 – Advanced Coding

ISO/ IEC 13818-2	Information Technology – Generic coding of moving pictures and associated audio information Part 2 Video Coding
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**The Digital Europe E-Book** is one of the primary references used in this specification. Others include ETSI, ISO and DVB

#### 4. **Marking of Receiver**

Each iDTV receiver shall be legibly and indelibly marked with at least the following information:

- a) Manufacturer's name or trademark (if any);
- b) Model designation and Serial Number;
- c) Country of manufacture;
- d) Input supply voltage and frequency;
- e) Power consumption;
- f) Terrestrial input terminal (or Cable/Satellite input terminals, if available);
- g) All Connectors

The UI of the Television shall also display the following:

- a) Serial Number of the iDTV receiver unit;
- b) Tuner(s) present;
- c) Serial Number; and
- d) Firmware version of the present Tuner(s).

## 5. Receiver Profile

No	Resources	Reference/Detail		Notes
1	Services Summary	<p>The receiver must give access to digital terrestrial television services on the particular DVB-T2. This must include the capability to efficiently present radio services, DVB subtitles and Digital Text services. It must present DVB subtitles when broadcast and if requested by the viewer; manage the output video in both widescreen 16:9 and 4:3 picture formats to suit the display.</p> <p>The processing power and memory configuration of the receiver must be suitable for the routine operation of FTA digital Terrestrial reception, (DVB-T2) together with the embedded operation of HD MHEG-5 Version and the provision of the routine replacement of all software via „through-the-air-download“.</p>	Mandatory	
2	<b>Video &amp; Audio</b>			
2.1	MPEG4 Video	H.264 AVC Decoding MP@L3 HP@L4	Mandatory	ISO/IEC 14496-10:2005 (Information Technology – Coding of audiovisual objects – part 10 – Advanced Coding)
2.2	MPEG2 Video	MPEG2 MP@ML, video resolution, 720x576 (PAL)	Mandatory	ISO/IEC 13818-2
2.3	<b>HDTV Formats</b> (For Full HD or HD Ready iDTVs only)	<b>Resolution/ Frame Rate/ Scanning / Aspect Ratio</b>		
		1920x1080/50/ Progressive/16:9	Optional	
		1920x1080/25/ Progressive/16:9	Mandatory	
		1920x1080/25/ Interlaced/16:9	Mandatory	
		1280x720/50/ Progressive/ 16:9	Mandatory	
		1280x720/25/ Progressive/ 16:9	Optional	
2.4	<b>SDTV Formats</b>	Resolution/ Frame Rate/ Scanning/ Aspect Ratio		
		720x576/25/ Progressive/16:9&4:3	Optional	

No	Resources	Reference/Detail		Notes
		720x576/25/ Interlaced/ 16:9&4:3	Mandatory	
2.5	<b>Active Format Descriptors</b>	Ability to handle 16:9 widescreen and 4:3 picture format changes as detailed in the "transmission rules" including support for correct aspect ratio and Active Format Descriptors.	Mandatory	ETSI TS 101154
2.6	<b>Audio Decoding</b>	MPEG1 Layer II /Musicam, audio mode stereo. SamplingRate32, 44.1&48KHz	Mandatory	ISO/IEC 11172-3
		AC-3,32,44.1&48KHzPass Through Only	Mandatory	ETSI TS 102 366 v1.2.1
		E-AC-3,32,44.1&48KHzDown-mix to a stereo Pair	Mandatory	ETSI TS 102 366 v1.2.1
		MPEG-4HE AAC (monoandstereolevel2bit-streamonly)	Mandatory	ISO/IEC 14496-3.Level2HE AAC audio for services will be encoded as stereo. It is optional for the receiver to decodelevel4multi-channel bit-streams.
2.7	<b>Subtitles</b>	DVB subtitles shall be invoked from a suitable labeled remote control key which is always under the control of the receiver.	Mandatory	ETSI EN 300743V1.3.1(rev7HD amendment)
2.8	<b>Teletext</b>	The DTV shall include a Teletext decoder as defined by ETSI standard EN 300706 Enhanced Teletext Specification including up toTeletextV1.5.A suitable remote control button must be provided to launch the Teletext OSD display	Mandatory	ETSI EN 300706
2.9	<b>Multi-Language Support</b>	The receiver is to at least support the setting of a primary and secondary audio language based on the ISO639 language descriptors associated with the audio- streams in the ISO/IEC13818MPEG2 transport stream.	Mandatory	If the primary language is not present then the receiver shall automatically select the secondary audio language. When the secondary audio language is also not available then the country default language shall be selected. When the default language is also not available then the receiver shall select the first audio primary audio PID appearing in the PMT elementary stream loop.



No	Resources	Reference/Detail		Notes
2.10	Audio Description	<p>Receivers that are capable of presenting audio description shall provide at least the minimum user controls.</p> <p>Account should be taken in the design of controls that many users of audio description are visually impaired.</p>	Optional	ETSI TS 101154AnnexE.
2.11	Broadcast Mixed Audio Description	In addition to the audio language user preferences (See3.9), receivers shall provide a user preference to enable broadcast mixed audio description.	Mandatory	
2.12	OSD	<p>Video Layer (a full colour layer displaying the output of the MPEG video decoder) Layer to support:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Y=8 bit, Cb=8 bit, Cr=8 bit</li> <li><input type="checkbox"/> Chroma to be sub-sampled to either 4:2:0or 4:2:2</li> <li><input type="checkbox"/> Alpha blending need not be supported, but the layer may be shown or hidden.OSD/Graphics Layer (an8-bitpalletised layer which can display region-based graphics)</li> <li><input type="checkbox"/> Each CLUT palette entry to support: Y=6bit,Cb=4 bit, Cr=4 Bit</li> <li><input type="checkbox"/> Chroma to be sub-sampled to either 4:2:0or 4:2:2</li> <li><input type="checkbox"/> Alpha blending to be either 6bit across the entire layer, or 2bit per pixel</li> </ul>	Mandatory	
2.13	Receiver Character Set	The main Character set of the receiver shall be the Character code table 00–Latin Alphabet as specifiedinIS06937.	Mandatory	ETSI EN 300468AnnexA
3	Service Information			

No	Resources	Reference/Detail		Notes
3.1	EPG “Now/Next”	<p>“Now/Next” information for use in a non-screen banner shall be derived using information from DVB SI EI T p/f tables as per EN 300468.</p> <p>The actual appearance of the now/next banner is left to the manufacturer but it is recommended that the following information be displayed in the bottom third of the screen.</p> <ul style="list-style-type: none"> <li>• <b>Current</b> time</li> <li>• <b>Start</b> time of now and next programme</li> <li>• <b>End</b> time of now and next programme</li> <li>• <b>Logical</b> Channel Number</li> <li>• <b>Service</b> Name</li> <li>• <b>Date</b></li> </ul>	Mandatory	The EPG “Now and next” shall be displayed when the user changes service for approximately 2 Seconds and shall also be launched using the (info) button on the remote control.
3.2	EPG “Schedule”	An EPG application may be provided using EIT schedule information carried in the SI. Should fully support upto 7 days of EPG	Mandatory	
3.3	TDT/ TOT	<p>The receiver shall have a real time clock /calendar running continuously.</p> <p>The clock shall be updated by the incoming TDT and TOT table in the SI.</p> <p>The time displayed by the receiver shall be the local time.</p>	Mandatory	ETSI EN300468
3.4	Network Evolution	<p>The receiver shall support dynamic SI in order to automatically detect and suitably handle service changes without the need for user intervention.</p> <p>This should be done, for example, by reference to the SDT and/or NIT version numbers. Changes should be processed within 24 hours of the presence of correct SI signaling.</p> <p>This shall be without viewer disturbance.</p>		
4	<b>Digital Terrestrial Reception</b>			

No	Resources	Reference/Detail		Notes
4.1	<b>Receiver Installation</b>	<p>The receiver will perform an automatic scan based on the NIT information. It shall find all available DVB services.</p> <p>Before an automatic search the receiver shall delete all services currently held in the service list.</p> <p>In addition to an automatic search it shall be a requirement for the receiver to have a manual search feature whereby the user can select using remote control or input suitable tuning information.</p> <p>Any new services found shall be added to the service list. No duplicated services shall be displayed in the service list.</p>	Mandatory	
4.2	<b>Services Available</b>	<p>After receiver installation all services that may be received in that geographic region should be available to the viewer. The actual services being broadcast may subsequently change.</p>	Mandatory	
4.3	<b>Scanning for Terrestrial Services</b>	<p>The receiver shall be capable of automatically detecting changes in the services configuration of each broadcast transport stream provided that such changes are implemented by the broadcaster in accordance to the, transmission rules and are compliant with the DVB-SI standards.</p> <p>The intent of this requirement is to allow the broadcaster to vary the services offering within the relevant broadcast transport stream(s) without the viewer needing to rescan the receiver.</p>	Mandatory	ETSI EN 300468 ETSI TR 101211.
4.4	<b>Logical Channel Numbers for Terrestrial Services</b>	<p>The receiver shall detect and correctly process Logical Channel Number (LCN) signaling as defined in the DIGITALEUROPE E-Book.</p> <p>The receiver shall locate, store and handle services with Logical Channel Numbers (LCNs) within the ranges of 1to999.</p>	Mandatory	IEC62216
4.5	<b>Duplicate Terrestrial Services</b>	<p>If duplicate instances of a service (i.e. services that have been allocated the same LCN) are received from different transmitters, then the service with the highest received quality shall be placed in the correct LCN position.</p>	Mandatory	
4.6	<b>Selection via Service List</b>	<p>The service list displayed immediately following a full automatic scan must present services in ascending LCN order.</p>	Mandatory	

No	Resources	Reference/Detail		Notes
4.7	<b>Selection via Numeric Entry</b>	Selection of a service using numeric entry shall always select a service with that LCN regardless of any viewer favourites	Mandatory	
4.8	<b>Hidden Services</b>	Services marked as “hidden” in the LCN descriptor or where the LCN is zero (0) shall not appear in the service list presented to the viewer.	Mandatory	
4.9	<b>RF Input Connector</b>	IEC 60169-2	Mandatory	
4.10	<b>Input Impedance</b>	75 Ohm nominal	Mandatory	
4.11	<b>Channel Bandwidth</b>	VHF: 7MHz UHF:8MHz	Mandatory	
4.12	<b>Tuning Range</b>	VHF: 174MHz – 230MHz UHF: 470MHz -694MHz	Mandatory	Channel Centre Frequencies
<b>5</b>	<b>DVB-T2 Reception</b>			
5.1	<b>Modulation</b>	QPSK, COFDM, 16 QAM, 64 QAM, 256 QAM	Mandatory	ETSI EN 302755
5.2	<b>Signal Bandwidth</b>	VHF: 7 MHz UHF:8MHz Including Normal and Extended bandwidth modes	Mandatory	The receiver may not be required to handle 1.7MHz, 5MHz, 6MHz or 10MHz bandwidth signals.
5.3	<b>Receiver Noise Performance</b>	The tuner noise figure shall be 7dB or better.	Mandatory	
5.4	<b>Receiver Implementation Margin</b>	2.4dB or better.	Mandatory	
5.5	<b>FEFs</b>	Receivers shall not malfunction in the presence of FEFs. However it is not a requirement to decode them.	Mandatory	
5.6	<b>FFT Size</b>	Receiver shall be capable of detecting and presenting services transmitted using all DVB-T2 FFT sizes. i.e. 1k, 2k, 4k, 8k, 16k and 32k modes.	Mandatory	
5.7	<b>Constellations</b>	Receiver shall be capable of detecting and presenting services transmitted using all DVB-T2 modulation constellations, i.e. QPSK, 16-QAM, 64-QAM and 256-QAM.	Mandatory	

No	Resources	Reference/Detail		Notes
5.8	Code Rates	Receiver shall be capable of detecting and presenting services transmitted using all DVB-T2 coderates, i.e. 1/2, 3/5, 2/3, 3/4, 4/5 and 5/6.	Mandatory	
5.9	Guard Interval	Receiver shall be capable of detecting and presenting services transmitted using all DVB-T2 guard intervals i.e. 1/128, 1/32, 1/16, 1/8, 1/4, 1/2 and 1.	Mandatory	
5.10	Pilot Patterns	The receiver shall be capable of the correct reception and decoding of signals utilizing the following Pilot Patterns: PP1, PP2, PP3, PP4, PP5, PP6 and PP7	Mandatory	
5.11	Multiple PLPs	The receiver shall be able to receive DVB-T2 transmissions consisting of a single PLP and transmissions consisting of a common PLP together with multiple data PLPs.	Mandatory	
5.12	Time Frequency Slicing	The receiver shall not be required to handle TFS mode.	Mandatory	
5.13	SFN Operation	<p>The receiver correctly operates in the presence of two static echoes (i.e. 2 paths) with a relative delay in a range of 0.2 <math>\mu</math>s and 0.9 times the duration of the guard interval, independently of the value of the amplitude and of the relative phases.</p> <p>This is assumed to be the minimum requirement for operation in a Single Frequency Network.</p>	Mandatory	
5.14	Tolerance to Equal Amplitude SFN Signals	The receiver shall continue to correctly demodulate and decode the DVB-T/T2 signal in an SFN environment when there are two or more signals of equal amplitude present at the receiver input provided the maximum time difference between the signals is less than 90% of the guard interval. It is assumed the C/N each signal is greater than that specified in 5.6	Mandatory	
6	<b>Common Interface</b>			

No	Resources	Reference/Detail		Notes
6.1	Common Interface	<p>A common interface (CI) slot and associated software stack compliant with EN50221 and TS 101699 shall be provided.</p> <p>It is strongly recommended that the receiver supports the CI Plus Version 1.2 Specification.</p>	Mandatory	
7	<b>Outputs</b>			
7.1	DTV	The DTV may offer output(s) for connection to a recording device.	Optional	
7.2	<b>HDMI (For Full HD or HD Ready only)</b>	HDMI version 1.4 or greater and shall support HDCP.	Mandatory	
7.3	<b>Dolby Digital</b>	<p>S/PDIF for pass through of Dolby Digital (AC-3). IEC60958</p> <p>Either an optical and/or coaxial outputs.</p>	Optional	
7.4	<b>Analogue Phone Audio</b>	RCA Audio left (Colour–white) & Right (Colour–Red) connectors	Optional	
7.5	<b>Data Interface</b>	<p>The receiver shall have a data interface to perform software upgrades and should comply to one of the following options;-</p> <p>Universal Serial Bus Host (with support for Mass Storage Device Class) RJ45 (Ethernet)</p> <p>Should be capable of multimedia playback (MP3/MP4/JPEG/AVI etc) via USB 2.0</p>	Mandatory	
7.6	<b>Other interfaces</b>	CVBS, Y P b Pr, COAXIAL PAL/NTSC auto conversion		
8	<b>Remote Control</b>			
8.1	<b>Remote Control</b>	The manufacturer is free to design the remote control required:	Mandatory	
8.2	<b>Numeric Entry:</b>	<p>The following remote control keys are</p> <ul style="list-style-type: none"> <li>● <b>Keys 0-9</b></li> </ul>	Mandatory	

No	Resources	Reference/Detail		Notes
8.3	Basic TV Functionality:	<ul style="list-style-type: none"> <li>• <b>Power</b> Turns the receiver on and off</li> <li>• <b>Programme up/down</b> keys to switch between programmes</li> <li>• <b>Volume up/down</b> Keys to adjust the volume output level</li> <li>• <b>Subtitle</b> This key displays the subtitle as defined in section 3.9.</li> <li>• <b>Info</b> This key displays additional information if available.</li> </ul>	Mandatory	
8.4	Digital TV Functions	<ul style="list-style-type: none"> <li>• <b>EPG/Guide</b> This key displays an Electronic Programme Guide.</li> <li>• <b>Back</b> This function exits from the current menu or OSD and returns to the previous state.</li> </ul>	Mandatory	
9	<b>Upgrade</b>			
9.1	Auto-Upgrade	Receivers shall be capable of manual (i.e. with user request) software upgrade by Over the Air Download (OAD) with minimal interruption to the viewer and within 24 hours of availability of the download under normal operating conditions.	Optional	
10	<b>User Information</b>			
10.1	Easy to Use and Simple Documentation	Receivers shall be simple to set up and operate and be provided with clear easy to understand user documentation in line with that requirement.	Mandatory	
10.2	Support Package	<p>The following peripheral items should be included within a baseline DTV package:</p> <ul style="list-style-type: none"> <li>• Remote control and batteries</li> <li>• An easy to understand user manual</li> </ul>	Mandatory	
10.3	Status	A basic status check shall be available invoked by a menu driven option or a user selected key. The OSD is to present the reception quality, signal strength indicator and Channel ID	Optional	

No	Resources	Reference/Detail		Notes
<b>11</b>	<b>Conditional Access</b>			
11.1	<b>Conditional Access System</b>	Receivers shall be capable of supporting subscriber access to services, programmes and events (i.e. CAM, Smart Card, etc.).	Optional	
<b>12</b>	<b>Compliance</b>			
12.1	<b>DVB-T2</b>	ETSI standards as listed in the relevant sections of this specification.	Mandatory	
12.2	<b>Energy Standards</b>	The receiver should support the EU Code of Conduct and any local legislation on energy consumption.  Code of Conduct on Energy Efficiency of Digital TV Service Systems, Version 2,26May 2004EuropeanCommission-DGJRC TP450I-21020Ispra(VA)  Or Shall have Energy star rating	Mandatory	
12.3	<b>EN55013</b>	EMC emissions broadcast receivers	Mandatory	
12.4	<b>EN55020</b>	Broadcast receiver product immunity	Mandatory	
12.5	<b>EN60065</b>	Safety for mains operated domestic electrical equipment	Mandatory	
12.6	<b>EN61000-3-2</b>	Harmonic current emissions	Mandatory	
12.7	<b>EN61000-3-3</b>	Emission voltage fluctuations and flicker	Mandatory	
12.8	<b>EN61000-4-2</b>	Immunity to ESD	Mandatory	
12.9	<b>EN61000-4-4</b>	Immunity to fast transients	Mandatory	
12.10	<b>EN61000-4-5</b>	Immunity from surge	Mandatory	
12.11	<b>EN61000-4-11</b>	Immunity to voltage dips and interruptions	Mandatory	