
# MINIMUM TECHNICAL REQUIREMENTS FOR DVB-T2 RECEIVERS FOR THE KENYA MARKET

**MAY 2025**

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AC | Alternating Current |
| DC | Direct Current |
| AC-3 | Dolby AC-3 audio coding system |
| AFD | Active Format Descriptor |
| AGC | Automatic Gain Control |
| ASI | Asynchronous Serial Interface |
| C/N | Carrier to Noise Ratio |
| CPU | Central Processing Unit |
| CVBS | Composite Video Blanking and Synchronisation |
| DC | Direct Current |
| DDRAM | Double Data Random Access Memory |
| DDS | Display Definition Segment |
| DTS | Digital Theater Systems |
| DTT | Digital Terrestrial Television |
| DVB | Digital Video Broadcasting |
| DVB-CI | Digital Video Broadcasting – Common Interface |
| DVB SI EITp/f | Digital Video Broadcasting Service Information – Event Information Table, present and following |
| DVB-T2 | Digital Video Broadcasting - Second Generation Terrestrial |
| EIT | Event Information Table |
| EPG | Electronic Programme Guide |
| FEC | Forward Error Correction |
| FFT | Fast Fourier Transform |
| FTA | Free-to-Air |
| HD | High-Definition |
| HDCP | High-Bandwidth Digital Content Protection |
| HDMI | High-Definition Multimedia Interface |
| HDTV | High-Definition Television |
| HE AAC | High Efficiency Advanced Audio Coding |
| HE AAC v2 | High Efficiency Advanced Audio Coding Version 2 profile |
| HEVC | High Efficiency Video Coding |
| IDTV | Integrated Digital Televisions |
| LCN | Logical Channel Number |
| MPEG-4 | Moving Pictures Expert Group 4 |
| MPEG-H | Moving Picture Experts Group - High Efficiency |
| Multi PLP | Multiple Physical Layer Pipes |
| NGA | Next Generation Audio |
| NIT | Network Information Table |
| NWDL | Network Download |
| OAD | Over-Air Download |
| OTA | Over-The-Air |
| OUI | Organisation Unique Identifier |
| PID | Packet Identifier |
| PLP | Physical Layer Pipes |
| PMT | Program Map Table |
| QAM | Quadrature Amplitude Modulation |
| QPSK | Quadrature Phase Shift Keying |
| RCA | Radio Corporation of America |
| RF | Radio Frequency |
| SD | Standard Definition |
| SDT | Service Description Table |
| SFN | Single Frequency Network |
| SI | Service Information |
| SSU | System Software Update |
| STB | Set-Top-Box |
| TDT | Time and Date Table |
| TOT | Time Offset Table |
| TS | Transport Stream |
| UHD | Ultra High Definition |

# 1. INTRODUCTION

## 1.1 Background

The Communications Authority of Kenya is mandated by Section 36 of the Kenya Information and Communication Act (KICA) Act, 1998, to regulate the radio spectrum designated or allocated for use by broadcasting organisations and providers of broadcasting services in accordance with the standards and requirements of the International Telecommunications Union and its Radio Regulations as agreed to or adopted by the Republic. In furtherance of carrying out this function the law mandates the Authority to determine technical and other standards and issue guidelines for the operation of broadcasting organisations and bodies providing broadcasting services.

In compliance with the above mandate and in accordance with the Geneva 2006 (GE06) Agreement, the Communications Authority of Kenya completed the transition to digital terrestrial television and the analog switch-off in the summer 2015. This transition covered the frequency band 470–694 MHz (UHF Band IV/V).

## 1.2 Scope

This minimum requirement applies to DVB-T2 receiver devices for the Kenya market. This document specifies the minimum requirements for Receiver Devices, which are designated for the reception of terrestrial signals. Compliance with this guideline ensures that the IRD is able to receive, decrypt, decode and deliver the content to a display in an accurate manner.

The specified standard DVB-T2 receiver shall provide access to both SD and HD and the specified UHD DVB-T2 receiver shall provide access to both SD/HD and UHD signals transmitted over DVB-T2 modulation.

It may include access to an internal or external storage mechanism such as a Hard Disk Drive.

This document outlines a set of minimum requirements for IRDs (integrated receiver decoder), CAMs (Conditional Access Modules) and TV Sets with an integrated IRD.

All IRD requirements apply to TV Sets. Exceptions for TV Sets are written explicitly within the affected clause.

Requirements, which apply only to IRDs with PVR or PVR-ready functionality, are explicitly described.

This guideline defines only a minimum set of requirements and is not intended to be a complete specification for IRDs. It lists the minimum requirements to receive digital audio and/or video and/or data services distributed via DTT network.

## 1.3 Terminology

| | |
|---|---|
| Shall (mandatory) | Denotes that the item is mandatory. |
| Should (recommended) | Denotes that the item is not mandatory, but highly recommended. |
| May (allowed) | Denotes that the item is allowed. |

## 1.4 Transition

This minimum Technical Requirements for DVB-T2 Broadcasting Receivers cancels and replaces the Minimum Specifications for DVB-T2 Digital Set Top Boxes and Integrated Digital Television receivers for the Kenyan Market issued by the Authority in 2012 and 2015 respectively.
The effective date of implementation of the Minimum Technical Requirements for DVB-T2 Broadcasting Receivers is 1st July 2025.

## 1.5 Type Approval

All equipment suppliers and vendors are required to obtain type approval for DVB-T2 broadcasting receivers from the Communications Authority of Kenya, in line with the Kenya Information and Communications Act (*Cap.411A*). Authorized vendors/dealers of such equipment shall display, at the point of sale, a valid vendor authorization and type approval certificate issued by the Communications Authority of Kenya.

## 1.6 Normative references

The following normative references are indispensable for the application of this Guideline. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies. See Annex A

# 2. TECHNICAL REQUIREMENTS

## 2.1 Processor and memory

The processing power and memory configuration of the receiver shall be suitable for the routine operation of Free-To-Air DTT reception, DVB-T2, and the provision of the routine replacement of all software upgrade. The related parameter limits specified in Table 1 shall be complied.

| Parameter | Minimum requirements |
|---|---|
| Double Data Random Access Memory (DDRAM) | At least 256 MB, minimum baseline functionality |
| Flash | At least 256 MB, minimum baseline functionality |
| Central Processing Unit (CPU) processor speed | 1000 DMIPS 300 MHz, minimum baseline functionality |

Table 1. Processor and memory requirement specifications

## 2.2 Power supply & plug/socket connector type

The receiver may be Alternating Current (AC) or Direct Current (DC) powered. For AC powered equipment, the operating voltage shall be 240 V +5 %, -10 % and frequency 50 Hz ± 1 % or 230 V ± 10 % and frequency 50 Hz ± 1 % whichever is current.

Where external power supply is used such as AC adaptor, it shall not affect the capability of the receiver to meet this specification.

Adaptor shall be subjected to test under tropical condition (Kenya)

The plug/socket connector type is Type G, according to British Standard BS 1363 or type C

## 2.3 Receiver capability

The receiver shall give access to all Kenyan Free-to-Air DTT, radio and enhanced or interactive television services. The receiver shall include the capability to efficiently present radio channels, Digital Video Broadcasting (DVB) subtitles. It must present DVB subtitles when broadcasted and if requested by the viewer.

The receiver shall also be able to manage the output video in both widescreen 16:9 and 4:3 picture formats to suit the connected display. Where possible, receivers should be able to present both subtitles and interactive graphics simultaneously.

## 2.4 Zapping Time for TV Services

The receiver shall handle the switching between channels in a smooth and fast way.
The picture on the display during the zapping time shall be either frozen or black and the sound shall be muted until the new session has been stabilised.

## 2.5 Video

### 2.5.1 Video codec

The following codec and the profiles as described in Table 2 shall be supported by a compliant receiver. The codec is outlined below and further constrained by ETSI TS 101 154 [1] as stipulated in clauses 5.5,
5.6 and 5.7 shall apply. However, for High Efficiency Video Coding (HEVC) supported device, only clause 5.14 of ETSI TS 101 154 [1] is applicable.

| Receiver | Codec | Specification | Codec profile |
|---|---|---|---|
| Standard receiver | MPEG4 video | H.264 AVC Encoding, as stipulated in ISO/IEC 14496-10 [2] | MPEG-4 AVC MP@L3 SD Video stream |
| | | | MPEG-4 AVC HP@L4 HD Video stream |
| UHD receiver | HEVC video | H.265 Video codec as stipulated in ITU-T H.265 [3] and ISO/IEC 23008-2 [4] | HEVC High-Definition Television (HDTV) |
| | | | HEVC UHD TV |
| | | | HEVC HDR UHD TV |
| | | | HEVC HDR HFR UHD TV |

Table 2. Codec specifications

### 2.5.2 Resolutions

The following resolutions as stipulated in Table 3 shall be supported by a compliant receiver.

| Format | Codec / Resolution | Frame rate (Field rate) | Progressive / Interlaced | Aspect Ratio |
|---|---|---|---|---|
| 1080p50 | H.264 | 50 Hz (50 Hz) | Progressive | 16:9 |
| 1080p25 | | 25 Hz (25 Hz) | Progressive | 16:9 |
| 1080i25 | | 25 Hz (50 Hz) | Interlaced | 16:9 |
| 720p50 | | 50 Hz (50 Hz) | Progressive | 16:9 |
| 576i25 | | 25 Hz (50 Hz) | Interlaced | 16:9 and 4:3 |
| 540p25 | HEVC | 25 Hz (25 Hz) | Progressive | 16:9 |
| 540p50 | | 50 Hz (50 Hz) | Progressive | 16:9 |
| 720p25 | | 25 Hz (25 Hz) | Progressive | 16:9 |
| 720p50 | | 50 Hz (50 Hz) | Progressive | 16:9 |
| 1080p25 | | 25 Hz (25 Hz) | Progressive | 16:9 |
| 1080p50 | | 50 Hz (50 Hz) | Progressive | 16:9 |
| 2160p25 | | 25 Hz (25 Hz) | Progressive | 16:9 |
| 2160p50 | | 50 Hz (50 Hz) | Progressive | 16:9 |

NOTES:
For codec H.264, it refers to clause 5.7 of ETSI TS 101 154 [1].

For codec H.264 (576i25 format), it refers to clause 5.6 of ETSI TS 101 154 [1].

For codec HEVC, it refers to clause 5.14 of ETSI TS 101 154 [1].

Table 3. Resolution references

### 2.5.3 Output resolution control for STBs and portable digital terrestrial receiver

STBs and portable digital terrestrial receiver shall provide an option to change the output video format as required by the user either via the menu system and/or remote control. The receiver is to perform a down-conversion or up-conversion from any valid input resolution to a user selected video resolution output. If the video output format option is in the menu

structure of the receiver for the user to manually select, then a pop-up message will appear to confirm the selection or reset automatically to the default selection after a time-out period.

### 2.5.4 Widescreen

The receiver that optionally support analogue outputs may format the outputs for displays which are either 16:9 or 4:3. Both may also carry out a suitable rescaling of the video to 16:9 when working with Standard Definition (SD) outputs on a 4:3 display.

### 2.5.5 Active Format Description (AFD)

The receiver shall support at least the Active Format Description (AFD) as in Figure 1 and specified in Annex B of ETSI TS 101 154 [1].

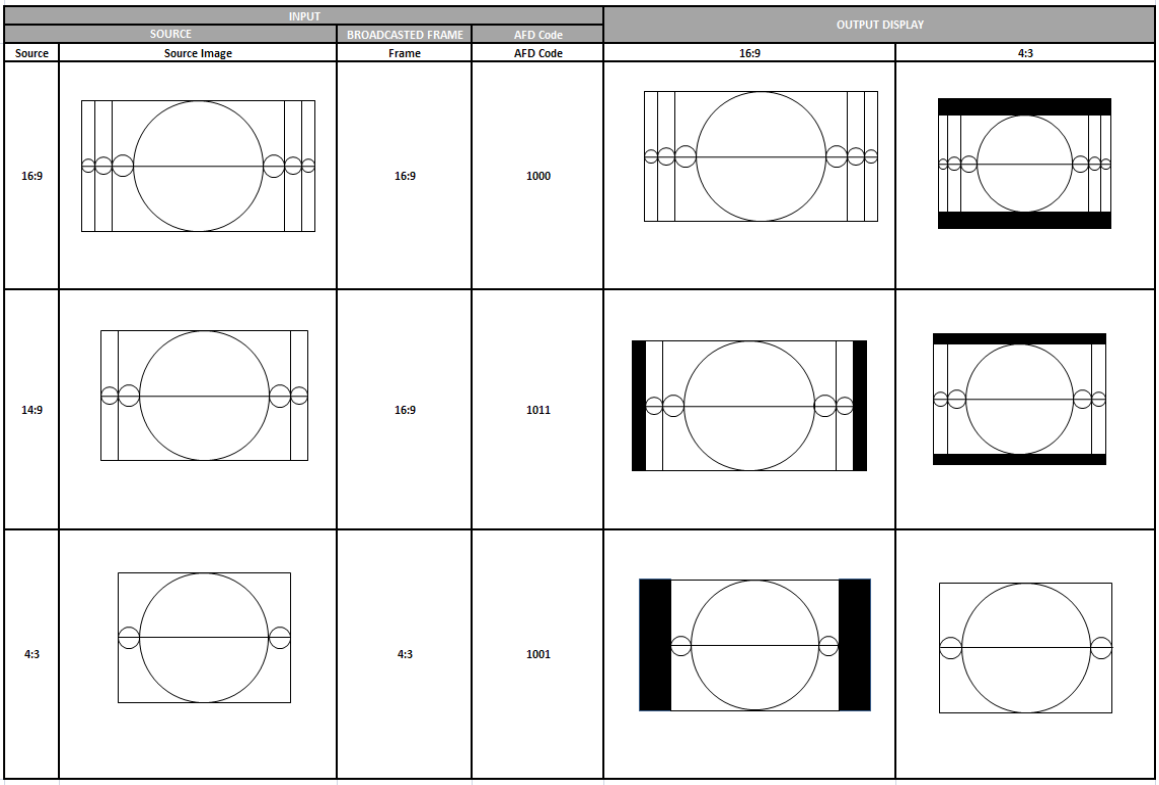


**Figure 1. AFD**

## 2.6 Audio

### 2.6.1 Audio codec

The following codec shall be supported by a compliant receiver as below:

a) Moving Pictures Expert Group 4 (MPEG-4) High Efficiency Advanced Audio Coding (HE AAC) audio services will be encoded according to ISO/IEC 14496-3 [5] and signaled or constrained by clause 6.4 and Annex C.5 of ETSI TS 101 154 [1], based on the decode capabilities below:

i. Receivers which supported with stereo capabilities only shall support MPEG-4 High Efficiency Advanced Audio Coding Version 2 profile (HE AAC v2) level 4 decoding including mandatory down-mixed and support of metadata as defined in clause 6.4.3 and Annex C.5 of ETSI TS 101 154 [1].

ii. Multichannel capable receivers may support MPEG-4 HE AAC v2 level 4 decoding including mandatory transcoding into either AC-3 or Digital Theater Systems (DTS) and support of metadata as defined in clause 6.4.3 and Annex C.5 of ETSI TS 101 154 [1].

b) The receiver may support Moving Picture Experts Group - High Efficiency (MPEG-H) Audio for Next Generation Audio (NGA) services according to ISO/IEC 23008-3 [6] and signaled or constrained by clause 6.8 of ETSI TS 101 154 [1]. The audio signals shall be encoded according to the baseline profile restrictions specified in clause 4.8.2.6 of ISO/IEC 23008-3 [6], and the CompatibleProfileLevelSet() config extension element specified in clause 4.8.2.7 of ISO/IEC 23008-3[6] shall be present MPEG- H audio bitstream pass-through to the digital audio connector is required when MPEG-H audio is supported.

### 2.6.2 Decoding options

The receiver shall support the respective decoding options as stipulated in Table 4.

| Codec | Analogue output / Speaker (IDTV) | Optical/Coaxial | HDMI |
|---|---|---|---|
| HE-AAC v2 (Stereo) | Decode (Requirement) | Stereo PCM or bitstream pass through (Optional) | Stereo PCM or bitstream pass through (Requirement) |
| HE-AAC v2 (Multichannel) | Down-Mixed (Requirement) | Transcode to AC-3 or DTS Bitstream and pass through (Optional) | Transcode to AC-3 Bitstream and pass through (Optional) |
| MPEG-H Audio ISO/IEC 23008-3 [6] | Decoded and rendered (Optional) | Stereo PCM, or bitstream pass through, or transcoded to DTS or AC-3 and bitstream passthrough (Optional) | Stereo PCM, or bitstream pass through, or transcoded to DTS or AC-3 and bitstream passthrough (Optional) |

Table 4. Decoding options

## 2.7 Subtitles

A compliant receiver shall be able to decode DVB subtitles according to the specification outlined in ETSI 300 743 [7]. DVB subtitles shall be invoked from a suitable labelled remote-control key which is always under the control of the receiver and not controlled by the middleware application.

All receivers shall also be capable of decoding and presenting correctly subtitles streams which include the Display Definition Segment (DDS) as outlined in ETSI EN 300 743 [7].

## 2.8 Multi-language support

The user shall be provided with primary and secondary language options for both subtitles and audio selection. The list of languages provided shall as a minimum contain all the languages outlined in the Table 5 below.

| ISO Language Names | ISO 639-3 Code | Endonym(s) |
|---|---|---|
| English | eng | |
| Swahili | swa | Kiswahili |
| Original audio | qaa | |

Table 5. Multi-language support

### 2.8.1 Subtitle selection

The order of priority for subtitle selection shall be as follows:

a) primary language;
b) secondary language; and
c) receiver's own selection criteria (optional).

The receiver may implement its own selection criteria after (a) and (b) fail to provide a language match.

### 2.8.2 Audio selection

The order of priority for audio selection shall be as follows:

a) primary language;
b) secondary language; and
c) receiver's own selection criteria (optional).

The receiver may implement its own selection criteria after (a) and (b) fail to provide a language match.

## 2.9 Receiver character set

The receiver shall at least be able to support use of the character coding for DVB services described in the latest version of the DVB specification ETSI EN 300 468 [8].

The broadcast shall not signal any character set selection information by ensuring that the first byte in any text field is either 0x1F (restricted to Event Information Table (EIT) tables) or in the range of 0x20 to 0xFF.

The receiver shall support compressed strings within all types of EIT tables. A compressed string shall be signalled by the method outlined in Annex A of ETSI EN 300 468 [8]. This is done by ensuring that the first byte of any compressed string is 0x1F. The second byte as outlined by ETSI EN 300 468 shall contain the encoding_type_id.

## 2.10 Common interface

Receivers may incorporate a Digital Video Broadcasting - Common Interface (DVB-CI) slot. If available, this slot shall be certified with CI+ slot as outlined in CI Plus Specification V1.3 or DVB-CI Plus 2.0 slot as outlined in ETSI TS 103 605 [9].

## 2.11 Tuner or decoder

A compliant receiver shall be in accordance to T2 base profile of ETSI EN 302 755 v1.4-1 [10].

### 2.11.1 Radio Frequency (RF) input connector

A compliant receiver shall be in accordance with IEC 61169-2 [11]. For other DVB-T2 receivers such as PC cards, dongles, portable TV, different Radio Frequency (RF) input connector may be used where appropriate.

### 2.11.2 RF loop-through

STBs may provide an RF loop through. The connector shall be in accordance to IEC 61169-2 [11] with a typical gain of 0 dB.

### 2.11.3 Input impedance

Input impedance shall meet 75 Ω nominal.

### 2.11.4 Frequency range and bandwidth

The receiver shall be able to scan and tune to the following frequency range and bandwidth as described in Table 6.

| Band | Frequency | Bandwidth |
|---|---|---|
| UHF IV and V | 470 - 694 MHz | 8 MHz<br>(7.77 MHz for extended mode)<br>(7.61 MHz for non-extended mode) |

Table 6. Frequency range and bandwidth

The receiver shall at least be able to receive carriers within an offset of up to 166 kHz from the nominal centre frequency.

### 2.11.5 DVB-T2 operating modes

The receiver shall support the operating modes as specified in ETSI EN 302 755 [10]. The minimum list of modes for each parameter that shall be supported by the receiver is outlined in the Table 7 below.

| Parameter | Required modes |
|---|---|
| FFT | 1K, 2K, 4K, 8K normal and extended, 16K normal and extended, 32K normal and extended |
| Constellation | QPSK,16QAM, 64QAM and 256QAM |
| Constellation rotation | Rotated and non-rotated |
| Code rate | 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 |
| Guard interval | Tu*19/128, Tu/8, Tu*19/256, Tu/16, Tu/32, Tu/128 |
| Pilot pattern | PP1, PP2, PP3, PP4, PP5, PP6, PP7 |
| SISO/ MISO | Both to be supported |
| PAPR | No PAPR and TR-PAPR |
| Forward Error Correction (FEC) frame length | 16200 and 64800 |
| Baseband mode | Normal mode, High Efficiency Mode |
| FEF and Auxiliary streams | DTT receiver does not require to demodulate or decode content of FEF parts and auxiliary streams but the existence of FEF and or auxiliary streams shall not cause the Receiver to malfunction. |
| DVB-T2 Lite profile | Optional |
| Scrambling of L1 post signalling | L1_POST_SCRAMBLED Support is Mandatory |

Table 7. DVB-T2 operating modes

### 2.11.6 Multi PLP feature requirements

The receiver shall support at a minimum both Physical Layer Pipes (PLP) Type 1 and Type 2 related to Multiple Physical Layer Pipes (Multi PLP) as outlined in ETSI EN 302 755 [10].

The receiver should be able to support SI information broadcasted in both the common as well as the data PLP.

Receiver shall at least be able to decode one data PLP and the common PLP at any one time.

## 2.12 Service list

After a receiver is installed, it shall offer the viewer all services that may be received in that geographic region compliant with the regional services requirement. The services being broadcast may change over time. To ensure that the viewer will always be able to access all services being broadcast to the selected region, the receiver shall detect and reflect to the viewer any such changes with minimal viewer involvement.

All services have an associated Logical Channel Number (LCN). Use of the LCN ensures that the viewer becomes familiar with a specific remote control unit button number for each channel. Access to, and use of, accurate Service Information (SI) is essential if the viewer is to enjoy all of the content being broadcast.

### 2.12.1 Scanning for services

The receiver shall provide a method for the user to install all services which clears any previous service list that might exist. During this installation process, the receiver shall scan for the RF channels outlined in this Guideline.

When a lock is achieved on a channel, the receiver shall obtain the list of services for the current multiplex from Service Description Table (SDT) actual. This process shall be repeated till the whole frequency range is complete.

### 2.12.2 LCN descriptor

LCN information shall be broadcasted via a privately defined LCN descriptor as outlined in Figure 2 below. This descriptor shall be broadcasted in the Transport Stream (TS) loop of the Network Information Table (NIT) on all multiplexes.

```
logical_channel_descriptor() {
        descriptor_tag                                  8  (uimsbf)
        descriptor_length                               8  (uimsbf)
        for (i=0;i<number_of_services;i++){             16 (uimsbf)
                service_id
                visible_service_flag                    1  (bslbf)
                reserved                                5  (bslbf)
        }
}
```

Figure 2. LCN descriptor

The LCN descriptor shall be set as follows:

a) descriptor_tag: This shall be assigned with the value 0x83.

b) visible_service_flag: 1 is visible and 0 is not visible.

c) reserved: All reserved bits shall be set to 1. The receiver shall ignore these bits.

d) service_id: This is a 16-bit field which serves as a label to identify this service from any other service within the TS. The service_id is the same as the program_number in the corresponding program_map_section.

### 2.12.3 LCN descriptor V2

The LCN V2 privately defined descriptor may be broadcasted as outlined in Figure 3 below. This descriptor contains additional information related to sorting of services depending on region. Receivers shall support this descriptor if broadcasted.

```
Logical_channel_v2_descriptor (){
descriptor_tag
                                        8       Uimsbf
descriptor_length                       8       Uimsbf
for (i=0;i<N;i++){
channel_list_id                         8       Uimsbf
channel_list_name_length                8       Uimsbf
for (i=0;i<N;i++) {
char                                    8       Uimsbf
}
country_code                            24      Uimsbf
descriptor_length                       8       Uimsbf
for (i=0;i<number_of_services;i++){
```

| | | |
|---|---|---|
| service_id | 16 | Uimsbf |
| visible_service_flag | 1 | Bslbf |
| reserved_future_use | 5 | Bslbf |
| logical_channel_number | 10 | Uimsbf |

Figure 3. LCN descriptor V2

The LCN descriptor V2 shall be set as follows:

a) descriptor_tag: This shall be 0x87 (decimal 135).

b) channel_list_id: This 8-bit id shall uniquely define the logical channel list for a particular region. This ID shall be unique within the original network.

c) channel_list_name_length: This 8-bit field specifies the number of bytes that follow the channel_list_name_length field for describing characters of the name of the channel list. The maximum length of the channel list name shall be 23 bytes.

d) char: This is an 8-bit field. A string of character fields specifies the name of the channel list, the channel_list_name (channel_list_name shall have a maximum length of 23 characters). Text information shall be coded using character table 00 as defined in Annex A of ETSI EN 300 468 [8].

e) country_code: This 24-bit field identifies a country using the 3-character code as specified in ISO 3166. Each character is coded into 8-bits according to ISO 8859-1 [13] and inserted in order into the 24-bit field. This shall be set to “MYS”.

f) service_id: A service_id that belongs to the TS (i.e., services from transport streams not in the current loop shall not appear). One service may only be listed once in each channel list, but may belong to or listed in more than one channel list.

g) visible_service_flag: 1 is visible and 0 is not visible.

h) reserved: All “reserved” bits shall be set to ’1’. The receiver shall ignore these bits.

i) logic_channel_number: This is the broadcasters preferred LCN for the service in question. Rules of operation are as per LCN management section of this specification.

## 2.12.4 Channel numbering

The LCN shall be obtained from the LCN descriptor as outlined in clause 2.12.3. The channel map shall be from 1 to 999 with valid LCN being assigned in the range from 1 to 799 by the broadcaster. The details of the channel map are outlined in Figure 4 below.

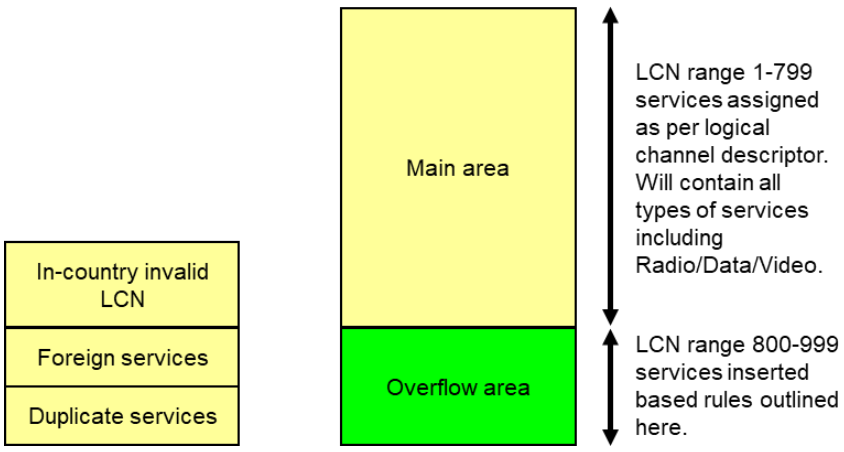


Figure 4. Channel map when there is a valid LCN descriptor

The description of the channel numbering mapping is described as below:

a) Main area: Services shall be ordered here according to the channel map as described by the logical channel descriptor. If no valid logical channel descriptor exists, please refer to the no logical channel descriptor section overflow area.

b) Overflow area: Below is the list of different categories within the overflow area.

i. In country invalid LCN: Any service which has not been assigned a LCN or has been assigned a number outside the valid range of 1-799, shall be placed in the overflow area. This section should only be used when there is a valid logical channel descriptor within the network. Please refer to the no logical channel descriptor.

ii. Foreign Services: Any service belonging to an original network other than the in country original network shall be placed in the overflow area.

iii. Duplicate Services: If two or more unique services (unique DVB triplet) are assigned the same LCN the service belonging to the multiplex with the best RF quality shall be placed in the LCN assigned by the logical channel descriptor. All other services shall be placed in this category of the overflow area.

Receivers may implement their own order of services within the overflow area.

When no logical channel descriptor is found within the in country original network, all in country services shall be assigned LCN in any order sequential from 1 onwards as outlines in Figure 5.

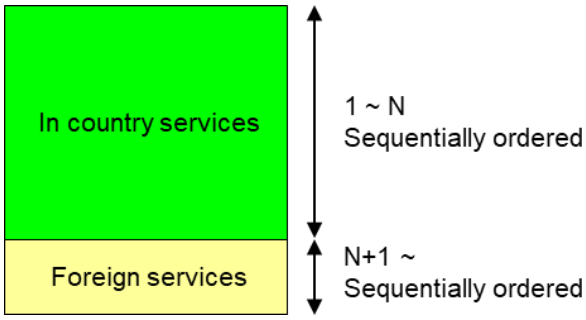


Figure 5. Channel map when LCN descriptor is not broadcasted

Services from the original network of foreign countries shall be placed immediately after the last in country service.

When there are duplicate services (same DVB triplet) only the service from the multiplex with the best RF quality shall be visible to the user, the duplicate shall not be assigned an LCN.

## 2.12.5 Regional broadcast management

A regional multiplex might contain one or more services which have events that differ from one region to another.

The receiver shall decode the logical channel descriptor version 2 as outlined above.

During initial installation, all channel lists for the country selected by the user shall be collated by the receiver. Once the scan is complete, if there is more than one valid channel list, the user shall be given a method to select a preferred list. The wording of the selection items presented to the user shall include the 23-character string broadcasted in the descriptor.

The receiver shall then order the services based on the selected channel list. The details are described as in example shown in Table 8 below.

| **channel_list_id** | 0x00 | |
|---|---|---|
| **channel_list_name** | Central region | |
| **Service ID** | **Service name** | **LCN** |
| 0x1001 | News Central Region | 001 |
| 0x2001 | National Entertainment | 002 |
| 0x2002 | National Documentaries | 003 |
| 0x1002 | News Southern Region | 100 |
| 0x1003 | News Northern Region | 101 |

| **channel_list_id** | 0x01 | |
|---|---|---|
| **channel_list_name** | Northern region | |
| **Service ID** | **Service name** | **LCN** |
| 0x1001 | News Central Region | 100 |
| 0x2001 | National Entertainment | 002 |
| 0x2002 | National Documentaries | 003 |
| 0x1002 | News Southern Region | 101 |
| 0x1003 | News Northern Region | 001 |

Table 8. Channel list example for three different services

| **channel_list_id** | 0x02 | |
|---|---|---|
| **channel_list_name** | Southern region | |
| **Service ID** | **Service Name** | **LCN** |
| 0x1001 | News Central Region | 101 |
| 0x2001 | National Entertainment | 002 |
| 0x2002 | National Documentaries | 003 |
| 0x1002 | News Southern Region | 001 |
| 0x1003 | News Northern Region | 100 |

**Table 8. Channel list example for three different services** *(continued)*

In the example above, the news service with regional variation is being broadcasted on three services. Based on the user selection the receiver shall be able to place at the most appropriate service in the main LCN slot. The screenshots as in Figure 6 below give a feel for the process that the user should experience and the interaction expected between the user and the receiver.


Figure 6. User experience during channel list selection

In this example, a news channel has 3 regional variations, central, northern and southern. The service for the user's own region should be placed at LCN 1 while the services for the other regions if the receiver is able to receive them shall be placed at LCN 100 onwards.

If the services for other regions are not included in the list, according to LCN ordering rules, these services shall be moved into the overflow region.

## 2.12.6Network evolution

The service line up of the network is considered to be quasi static. The receiver shall update the service list according to the rules outlined below to enable the broadcaster to evolve the network as necessary. Network evolution may occur frequently requiring the receiver to be able to track changes in the network.

The receiver is required only to update its service list when it is possible for it to do a complete scan without interruption to viewer's usage of the receiver. However, the receiver may do a partial update of the service list if this does not cause disruption to the viewer.

a) service addition and deletion

Services shall be added and deleted according to the service line up in the SDT actual.

b) multiplex addition

During the network evolution scan if a new multiplex is found, the services in the multiplex shall be added to the service list.

c) multiplex deletion

During the network evolution scan if a multiplex which was previously in the network list is no longer found the receiver shall delete all the services in the multiplex from the user service list.

Receivers may optionally implement measures to ensure that a multiplex is not deleted due to the temporary non availability of a multiplex due to transient broadcast conditions (example rain). Concerns regarding temporary loss of multiplexes shall take precedence over the requirement above,

d) clash resolution

The basic rules of operation shall follow the rules as outlined in the LCN management section. In addition to this the receiver shall also conform to the following rule of operation.

If a new service was found during the network evolution scan and if the assigned LCN is already being used by another service. The new service shall take precedence if the current service was not found during the same scan.

The receiver may give priority to services which have been moved or added by the user instead of following the rules above.

### 2.12.7 Selection via service list

The initial displayed service list following a fully automatic scan shall present services in ascending order of LCN.

### 2.12.8 Hidden services

Services identified as “not visible” in the LCN descriptor shall not appear in the service list presented to the viewer. However, such services may be selectable by direct numerical entry.

## 2.13 Electronic Programme Guide (EPG)

### 2.13.1 EPG "Now and Next"

"Now and Next" screen guide shall be derived using information from Digital Video Broadcasting Service Information – Event Information Table, present and following (DVB SI EITp/f) tables as per EN 300 468 [8]. The presentation of the "Now and Next" banner is as per manufactures chosen user interface, but it is desirable for the following information to be displayed in the bottom third of the screen.

a) current time;
b) start time of now and next programme;
c) end time of now and next programme;
d) LCN;
e) channel name;
f) date;
g) event name;
h) short description;
i) extended description;
j) genre;
k) sub-genre; and
l) parental ratings.

The Electronic Programme Guide (EPG) "Now and Next" shall be displayed when the user launches the application via the "i" (info) button on the remote control or any equivalent function (i.e. access EPG from virtual menu). If a descriptor is missing from the EIT table – the receiver shall not display an error message.

The EPG "Now and Next" should be displayed when the user changes channels for approximately 2 secs.

### 2.13.2 EPG "Schedule"

The receiver shall be able to capture and display at least 7 days of EPG based on broadcasted EIT schedule information. EIT information capture shall be done in the background continuously. This will enable the receiver to display the Full EPG as soon as the EPG button is pressed or any equivalent function (i.e access EPG from virtual menu).

## 2.14 Clock

The receiver shall be able to display real time clock/calendar information. The clock information shall be updated by the incoming Time and Date Table (TDT) and Time Offset Table (TOT) table in the Service Information (SI). The receiver shall display the clock in local time being adjustable for display in both 12 hour and 24 hour format.

## 2.15 Outputs

### 2.15.1 Primary output

The receiver shall have at least one HDMI output with High-Bandwidth Digital Content Protection (HDCP).

The HDMI profile used by the receiver shall be able to at least output the highest resolution supported.

### 2.15.2 Secondary output

In addition, STB may have the following:

a) RCA (phono) providing CVBS video. Shall meet the characteristics in ITU report 624-4 [14].

Receivers may provide the following and if provided, it shall conform to copy protection rules in clause 2.2.17.4.

b) RCA (phono) providing component YpbPr output.

If available shall meet the characteristics in ITU-R Report BT.624-4 [14].

### 2.15.3 Analogue phono audio

STB may provide RCA audio left (colour – white) and right (colour – red) connectors.

### 2.15.4 Copy protection on outputs

The receiver shall provide HDCP digital content protection on the HDMI output for all output resolutions. The receiver is not to output any High-Definition (HD) format on any analogue video outputs.

A HD format is defined as any signal having a luminance resolution as defined in clause 5.7 of ETSI TS 101 154 [1].

## 2.16 Remote control

A remote control is to be supplied with the receiver. The manufacturer is free to design the remote.

## 2.17 Maintenance and upgrade

To allow for software changes receivers shall be upgradeable in a practical manner, e.g. Over-The-Air (OTA) download. The process of upgrading should cause minimal disruption to the viewer. However, to minimise the diversity of deployed software builds and to most efficiently use the available broadcast capacity, the receiver must detect and act upon the broadcast of a relevant software download within 24 hours of its transmission commencing.

### 2.17.1 Software update

Support for the use of DVB System Software Update (SSU), to at least the simple profile as defined in ETSI TS 102 006 [15] is required. Receivers shall be able to handle the presence of software downloads in any NIT referred carrier signal.

Receivers shall be capable of automatic (i.e. not user initiated) software upgrade by Over-Air Download (OAD) or Network Download (NWDL) with minimal interruption to the viewer.

Manufacturers shall ensure that the receiver offered shall only respond to a unique Organisation Unique Identifier (OUI) code. This means that the receiver offered shall not react to any other OUI from any other manufacturer nor react to any other OUI from the same company which relates to a different model receiver.

The default DVB-SSU mode for receivers shall be with DVB-SSU “enabled”.

### 2.17.2 User software upgrade

The receiver shall provide one or more of the following data interfaces to enable the user to perform software upgrades.

a) USB;

b) RJ 45 (Ethernet IEEE 802.3); and

c) appropriate memory card.

### 2.17.3 Status

The receiver shall provide a diagnostic screen triggered by a menu driven option providing the following basic information:

a) Software version

RF signal information which may include one or all of the following information, Automatic Gain Control (AGC), Pre FEC Bit Error Rate and/or Post FEC bit Error Rate.

b) Optionally the receiver may also include the following information:

i. Audio Packet Identifier (PID);

ii. Video PID; and

iii. Channel ID

## 2.18 DVB identifiers

The following DVB identification values shall be used in the broadcast in Kenya as outline in Table 10 below.

| Identifier | Value |
|---|---|
| Original network ID | 0x2194 |
| Private data specifier | 0x00002194 |
| Network ID range | 0x3201 – 3300 |
| Character Code Table | ISO-8859-1 (alias Latin-1) |

Table 10. DVB identifiers

**Annex A**
(normative)

**Normative references**

| | | |
|---|---|---|
| [1] | ETSI TS 101 154 V2.6.1 | Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcast and Broadband Applications. |
| [2] | ISO/IEC 14496-10:2014 / Rec. ITU-T H.264 | ISO/IEC 14496-10 / Recommendation ITU-T H 264: Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding, 2014. |
| [3] | Recommendation ITU-T H.265 | Infrastructure of audiovisual services – Coding of moving video - High efficiency video coding |
| [4] | ISO/IEC 23008-2 / Rec. ITU-T H.265 | ISO/IEC 23008-2 / Recommendation ITU-T H.265: Information technology — High efficiency coding and media delivery in heterogeneous environments Part 2: High efficiency video coding. |
| [5] | ISO/IEC 14496-3:2009 | ISO/IEC: Information technology – Coding of audio-visual objects – Part 3: Audio, 2009. |
| [6] | ISO/IEC 23008-3 | Information technology – High efficiency coding and media delivery in heterogeneous environments – Part 3: 3D audio |
| [7] | ETSI EN 300 743 V1.3.1 | Digital Video Broadcasting (DVB): DVB Subtitling Systems. |
| [8] | ETSI EN 300 468 V1.17.1 | Digital Video Broadcasting (DVB): Specification for Service Information (SI) in (DVB) systems. |
| [9] | ETSI TS 103 605 | Digital Video Broadcasting (DVB); Second Generation Common Interface (CI); Implementation Using the Universal Serial Bus (USB) |
| [10] | ETSI EN 302 755 V1.4.1 | Frame structure channel coding and modulation for a second-generation digital terrestrial television broadcasting system (DVB-T2). |
| [11] | ISO/IEC 61169-24 (ISO 169-24) | Radio-frequency connectors – Part 24: Radio-frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable distribution systems (Type F). |
| [12] | ISO 3166 – Part 1-3 | Codes for the representation of names of countries and their subdivisions:<br>Part 1: Country codes<br>Part 2: Country subdivision code<br>Part 3: Code for formerly used names of countries |
| [13] | ISO 8859-1 | Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1, 1998. |
| [14] | ITU/R Report 624-4 | ITU-R Report 624-4:1990, Characteristics of Television Systems. |
| [15] | ETSI TS 102 006 V1.4.1 | Digital Video Broadcasting (DVB); *Specification for System Software Update (SSU) in DVB Systems.* |