BOCRA

TECHNICAL SPECIFICATION

FOR

DIGITAL TERRESTRIAL SET TOP BOX

ISSUED BY

BOTSWANA COMMUNICATIONS REGULATORY AUTHORITY

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Technical Specification
for
Digital Terrestrial Set Top Box

Contents

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Scope

This specification shall apply to all the Digital Terrestrial Television broadcast Set Top Boxes that shall be manufactured, imported or used in Botswana for the purpose of receiving the DTT broadcast programmes by the viewers/consumers or any other purpose that shall be deemed to access the DTT Network. It will not apply to integrated Television set, portable and mobile receivers.

The specification gives the minimum requirements in which the STBs shall comply. The other value added features, including, but not limited to High Definition TV decoding, Satellite decoding, Conditional Access, Return Path would be dictated by the market.

Botswana Communications Regulatory Authority shall type-approve all set top boxes based on the minimum specifications as outlined in this document.

Annexure 1 gives the details of each feature specified under the Operational and Technical Specifications.

Entry into force

This specification shall enter into force on 12/11/2014.

Document History

Description	Status	Date
Edition 1	Approved	November 2014

Operational Specifications Summary

	Feature	Description/functionality
1	On/Off button	Switches the STB power on or off
2	On Screen Display	Presents the channel programme Number or Programme guide on the screen
3	Electronic Programme Guide (EPG)	Lists the schedules, displays them on screen once operated
4	Auto/Manual Search	The unit will perform an automatic search for channels or can be selected manually
5	Signal Quality level indicator	Illuminates green when broadcast signal is good and yellow when weak or poor quality (reception)
6	Video Output	PAL I is the video signal for Botswana and most analogue TV sets have PAL I inputs
7	Languages	English is the official language, STB Operational Manual should be in English. Setswana is optional
8	Remote Control IR	Commands and execute the full STB functions. Small in size and using AA or AAA batteries.
9	Channels 1-100; minimum of 100 TV channels storing	The STB software must perform the storing of at least 100 programmes be selectable at random as and when the viewer wishes
10	Warranty	The STB should carry a minimum of 1 year/12 months warranty
11	Operations Manual	English language: Clear and easy to understand with basic trouble shooting and pictorial illustrations.
12	Conditional Access (optional)	Optional and shall not prohibit viewers on free-to -air DTT channels
13	Connectors	Rear Panel

Technical Specification Summary

	Feature	Specification
1	Input Impedance	75Ω
2	AC Mains Power supply	220V ±20V 50Hz ±2Hz
3	DC power supply	Optional 12V
4	Power plugs	BS 1363, 4573, 546-3pin
5	Network functionality	MFN and SFN
6	Connectors	RCA 3 connectors (2 audio and 1 video)
7	Modulation	In compliance with the GE06 Channelling Plan of Rec. **ITU-R BT.1306 (ITU Region 1 Equivalent-Optional)**
8	FEC on OFDM	Comply with **ITU-R.BT.1306 (ITU Region 1 Equivalent-Optional)**

9	Input signal	-35 to -85dBm
10	Frequency	UHF (470-694MHz) VHF (174-230MHz) Optional
11	Signal Bandwidth	8MHz Channelization Plan of GE06
12	Guard intervals	1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 19/128, 19/256
13	Channel/Noise Ratio	3dB(QPSK1/2) to 24dB(256QAM 5/6) **ITU-R.BT.1306 (ITU Region 1 Equivalent-optional)**
14	Interleaving	Bit+Cell+Time+Frame
15	Video decoding	MPEG-2 and MPEG-4 (H.264) are required.
16	PAL I	625 Lines, 50 Hz, Video bandwidth: 5MHz
17	Aspect Ratio	4:3 and 16:9
18	Frame frequency	25Hz
19	Conditional Access	Smart card /software applicable (optional)
20	RAM	128Mbytes (DDRAM) 8Mbytes (Flash
21	Processor	≥300MHz
22	Bit stream conversion	MPEG-2 ISO/IEC 13818
23	Audio decoding	Sampling rate: 32kHz, 44.1kHz and 48kHz (Dolby and other related approved audio decoding optional)
24	Serial Interface	RS 232
25	Audio mode	Single track/dual track/stereo
26	GE06 channelization Plan	Compliant
27	STB electronic Components	Comply with approved testing procedures and ITU equivalent
28	Intrinsic radiation immunity	EN 55024 or CISPR 24
29	Harmonic Current Emission	EN 61000-3-2/IEC 61000-3-2
30	Voltage Fluctuations	EN 61000-3-3/IEC 61000-3-3
31	Emission for residential and commercial premises	EN 61000-6-X/IEC 61000-6-X

Additional Notes

BOCRA recognises equivalent standards from other standardisation bodies and countries in ITU Region 1.

Annexure 1

I. Manual

The Operation's Manual for the STB shall be written in the English language and easy to read, understand and follow. It shall have the basic installation guide. Setswana will be an optional extra. Use of graphic/drawing for illustation is encouraged. The whole doument shall not exceed 10 pages and the font size not be less than 10.

II. Decoding and Outputs

The Set Top Box shall be a decoder which should be able to decode the DTT signal and has an analogue output of PAL I. The other outputs such as HDMI and USB shall be deemed optional. In the event these are included, the type approval for them shall follow the same criteria. A USB port shall be provided where a device can be connected for upgrades.

It shall be able to search channels both automatically or manually. Most of the TV sets have the AV inputs using RCA connectors. This allows simpler input with colour coded cable leads for the viewers. There shall be stereo (left and right) outputs for audio using RCA connectors (females) and the video output shall be an RCA connector (female) as well. **The acceptance test for electronic components shall be in accordance with approved processes and acceptable to the ITU or Region 1 equivalent.**

III. Remote Control

It shall have Infra Red (IR) remote control which is easier to operate or use. The remote control shall be powered by either 1 (one) AA battery or 2 (two) AAA batteries. It shall have the capability to switch on/off the STB, change, scan, program/edit/re-arrange channels as well as reduce or increase the volume. The remote should be able to access the root and sub-roots menu of the STB. The remote shall be in the category of low power emitting devices.

IV. Front Display

It shall display the programme Number on the front panel either selected manually or through the IR Remote Control. The Channel number is essential for the storage and selection of channels. The viewer will then know according to the numbers which channels are where once the STB has been programmed accordingly.

V. Front Panel Menu Buttons & LEDs

There shall be standard LEDs to indicate good or bad signals. These shall be clearly illustrated in the manual. There shall be all the necessary buttons for manual operation on the front panel. These include but not limited to the following: the Menu button, the power "on/off", the channel selection "up/down"and volume control. The STB should glow red on power LED when "ON" and black when it is OFF.

VI.   On Screen Display

It is mandatory that the STB has capability for 'On Screen Display'. The OSD will enable the viewer to view any information that she/he wishes to bring forward for reading

VII.   Electronic Programme Guide

EPG shall be displayed by the use of the IR remote control or by manual operation through the menu button on the front panel of the STB. This shall be an exclusive button on the Remote Control. The IR remote control should enable the viewer to input the programme number with much ease for choice of Programme. The EPG also has information on the programme running or the subsequent programme information in which the viewer can choose to view when the programme is of interest. However, the standard EPG which is globally accepted shall be used which shall have 24x7 days schedule.

Any data casting such as news online, notices etc. that will be available in the transmission shall be displayed as and when needed by the viewer. The STB shall be able to clearly display any transmitted information intended for the viewer.

VIII.   Warranty

It shall carry a minimum of 1 (one) year warranty.

IX.   Packaging (include batteries)

The Set top Box shall be packed in a sealed box. In the event the seal is broken the purchaser shall have the right to refuse the item. In addition, the packaging shall contain in it the remote control with sealed batteries, the AV Cable, the Operations Manual and the power cable.

X.   Connectors

The AV connections together with Power supply connector, the USB port and the HDMI shall be at the rear of the STB. It shall also have RF in and RF out connectors. Should the STB have external power input other than the mains supply, it shall also be on the rear panel of the STB.

XI.   Navigator (USER INTERFACE)

The STB shall have a navigator menu, activated by remote control and shall be in English, Setswana is an option.

I.   Power Supply

The AC supply in Botswana is 240V at 50Hz. The STB shall operate from an AC supply of 220V ±20V at 50Hz ±2Hz. Mains supply in Botswana is as stated above and it is mandatory as this will not change in the near future. Mains connection shall conform to any of the specifications for the power outlets listed in this document.

There are commonly used power plugs and outlets in Botswana. The power plugs and sockets shall be any of the following standards;

BS 1363

BS 4573

BS 546 – 3pin

All STB power supplies must be fused. In the even the manufactured chooses the BS4573 or BS 546 -3pin, there shall be a 13 Amp fuse installed before the circuitory of the STB.

II.   DC power supply

The STBs may have an additional DC power socket for 12V power supply. The socket shall be mounted on the back panel insulated with centre pin at 2.1mm diameter and the plug with the centre hole being positive (+) and the outer part being negative (-). It shall not exceed the 5A rating. Where this is available, the connector cable to battery shall be supplied with colour coded leads (red for positive and black for negative.

III. Electromagnetic Compatibility (EMC)

The EMC standards aim to minimise electromagnetic interference from electrical and electronic devices to others and immunity to the interference. Some of the existing standards that are already in use shall form part of the compliance of the STBs. The following standards or equivalent shall apply;

EN 55024 or CISPR 24
Information technology equipment - Immunity characteristics - Limits and methods of measurement

EN 61000-3-2   IEC 61000-3-2
Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)

EN 61000-3-3   IEC 61000-3-3
Part 3-3: Limits — Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current 16A per phase and not subject to conditional connection

EN 61000-6-X or IEC 61000-6-X
Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments

IV. Network functionality

When the service provider (broadcaster) designs the networks such that they are either, Multi Frequency or Single Frequency Networks (MFN or SFN), the STB shall be able to operate in any of the areas of MFN and SFN. The STB shall not differentiate between MFN and SFN signals.

V. Conditional Access

The STB may provide for Conditional Access (CA). This is to enable the future expansion of broadcasting where Pay TV may be introduced. The facility for conditional access shall be in the STBs that will be used for that purpose only. It will not affect the basic STBs for normal access. The CA shall be optional and the CA shall be approved by the Authority where it has been included. The necessary documentation of the CA shall be provided for reference in the application for approval. STB with Conditional Access shall still carry Free to Air channels and shall not at any given time be affected by the non-payment of subscription of pay per view service providers. All STBs shall be able to carry free to air DTT services.

VI.   Off Air Upgrade

The STB shall have the ability to perform any software upgrade that might be available off air automatically. This shall in no way compromise the operation of the STB.

VII.   Tuning/Scanning procedures

The receiver shall, in case of same Transport stream Id and Service Id on two or more different frequencies save all frequencies, or select the frequency with better signal. The receiver shall be able to receive and react on tuning parameters in PSI/SI tables. In addition to the automatic search, the receiver shall allow a manual search where Channel Id (or frequency) is entered by the end user. The receiver shall tune to this channel, search all available transmission modes, add new services and replace existing services in the service list (without considering any quality criteria).

VIII.   Input impedance

The impedance shall be 75Ω for use with standard outdoor or indoor aerial via a coax cable. This is the nominal impedance that is used across almost all broadcast or receiver equipment of radio frequency signals. The source impedance and for maximum power transfer the input impedance shall match that of the unit. The antennae are based on the 75Ω specification.

IX.   Bypass Input

The decoder/receiver shall enable the RF to pass through to the set regardless of the mode of operation. i.e. whether on 'standby' mode or 'off where external input is required by the viewer, the STB should be able to provide for the desired input to be viewed without having to switch on the decoder or the STB. It shall maintain an RF input to RF output.

X.   Modulation

The modulation in the DTT has to have a high level of resilience in co-channel narrowband interference hence it is implemented in digital terrestrial TV broadcast.

There has to be a number of parameters that safeguard the tranmission signals against interference and also gives rise to minimum set of values that protects the customer in order for them to enjoy reception. The ITU has come up with specific recoomendations to guide broadcasters, equipment suppliers and other manufacturers to adhere to these standards.

Any STB which is to be imported, sold, distributed and operated/used in Botswana shall be able to decode digital terrestrial television broadcast which complies with the requirements of ITU-R.BT.1306 or ITU Region 1 equivalent.

XI.   Forward Error Correction

The FEC figures are standard in decoders and these are meant to safeguard inter carrier frequency interference. FEC consistently corrects any errors using the Reed Solomon sequence. The STB shall have an error free

recovery mode and the response time in the variation of shall be not more than 1 (one) second.

FEC coding shall be the nominal sequence of the OFDM. **The STB shall conform to the ITU-R.BT1306 or ITU Region 1 equivalent.**

XII.   Input signal

The sensitivity of the receive side of the STB is here specified. This is to enable bare minimum for the STB to be able to handle the minimum required signal in order to provide reproduction of the signal. In the event the signal is lost, the no signal shall be displayed on the screen. This will assist the viewer to be able to see that the TV set is not the one that is off but transmission has been lost.

The input signal level shall be a maximum of -35dBm which shall be the maximum allowed level. The -35dBm is specified in order that the demodulator will be protected. The input level is set at -85dBm which shall constitute the minimum input level to able to be detected and demodulated by the RF input unit. The minimum signal is set in order for the STB to be able demodulate because most of the terrestrial signals are at very low levels. In the same aspect, the maximum level of -35dBm has to be specified in order to protect the STB internal demodulator.

XIII.   Subtitles

The decoder shall be able to decode any subtitles from any of the recognised Standard. This shall be through the relevant key in the IR Remote control.

Subtitling is a must in most broadcast environment. It is in this manner that the programme will have in most cases English subtitles. In future production there might be the need to introduce Setswana Subtitles as well. The Subtitles shall not lag the video and audio and shall appear at the bottom of the screen. It is also required that a good and effective synchronisation of both video/audio and Subtitles is maintained. Ability to change the font size of the subtitle will be an added advantage. The STB shall be able to display Subtitling in reference to ETSI 300 706.

XIV.   C/N Range (Rice Range)

In any signal propagation, there is bound to be noise in the signal. In broadcasting environment there is need for a significant ratio between the carrier signal and the inherent noise. The bigger the ratio the better the quality of the video signal in the case of television broadcast. It is therefore necessary to set the minimum signal to noise ratio. QPSK 1/2 shall be 3dB to 24dB for the 256QAM 5/6. **The conformance shall be within Rec. ITU-R BT. 1306 or ITU Region 1 equivalent.**

XV.   Guard Intervals

The standard guard intervals allow separation of signals and it is desirable that a clear separation is recommended so that there is conformance in terms of the originating transmissions. It is however desirable those shorter guard intervals are used. This will increase the channel efficiency. The required guard intervals are as **ITU-R.BT.1306 or ITU Region 1 equivalent.**

XVI. Operational Frequency

The unit shall operate within the band of frequencies as agreed by the ITU for Region 1 which is 470 MHz to 694 MHz (UHF).

The above mandatory 470MHz to 694MHz is the specified digital terrestrial Television broadcast which the STB must receive.

XVII. Signal Bandwidth

Botswana is signatory to the ITU's Region 1 GE06 and the frequency planning that has been agreed and planned for is a bandwidth of 8MHz. **It is therefore mandatory that the STB shall decode channels in accordance with the GE06 Channelization plan.**

Frequency off set

An off-set frequency of 125 kHz from the nominal centre frequency is specified and the STB should be able to still decode the signal.

XVIII. Memory and processor

The RAM requirement is to be able to store the configurations for the STB and as well as any other information, the viewer does not have to store everything from the beginning when power is lost. The higher the RAM and the processor speed the better. The basic processor shall give the minimum required here and that it does not take much time to process the input commands. The unit shall consist of the following minimum specifications: 128Mbytes for DDRAM SDRAM, 8Mbytes for Flash Memory and 300MHz processor.

XIX. Aspect Ratio

A number of conventional TV sets are still in the 4:3 aspect ratio and mandatory is that the STB shall be able to provide for this format. This will enable the viewers to still enjoy the full screen viewing in the old TV sets. In the same token other productions are still done in the same format (4:3). For those that have wide screen ready TV sets, it is an advantage where a wide screen viewing is available for them to utilise it particularly in sport. The STB shall be able to produce 4:3 picture viewing with blank side shaded to black on a 16:9 format and also produce 16:9 viewing without leaving uncovered areas on the screen or oversizing the picture.

XX. Resolution

The resolutions tally well with aspect ratios. The STB shall be able to display 16:9 signal to 4:3 and the reverse shall also take place. The required video quality shall be 720x576 for the 4:3 for PAL aspect ratio and 1920 x1080 for 16:9

XXI. Frame Rate

The standard format for Botswana is PAL I. The 16:9 and 4:3 formats conform to PAL I which a number of TV sets in Botswana have as the basic format. The frequency frame shall be 25Hz for PAL.

XXII. Audio Decoding

The audio shall be sampled at 32kHz, 44.1kHz and 48kHz whereas any other sampling such as 96kHz will not be a mandatory requirement. An internationally approved formats such Dolby etc. can be used and documentation shall be provided for type-approval by the Authority. This will allow high quality audio presented in mono, dual or stereo signal to be received.

XXIII. Interface

The serial interface is the connection normally using the RS 232 to communicate with other devices. In other operational requirements, the RS 232 connector could also be an interface for the PC/Laptop to project data for a programme source. The requirement is generally for interoperability with other equipment for similar operations. The interface for RF video input shall be in accordance with the IEC 169-2 female input on 75Ω impedance and, shall also conform to IEC 169-2 male for RF bypass loop. The HDMI shall be optional.

XXIV. Software Application

With the technical evolution there is the need that the heart of today's ICT serves quite a purpose to effect that tying to specific brands and patent items defeats the objective of future development and versatility in the growth of sectors. The software application shall support the following:-
  • Data casting
  • Over the air trouble shooting
  • Over the air upgrading
  • Robust application
  • Operational efficiency
  • Re-boot without delay and display and withdrawal of subtitles

The Set Top Box shall deploy software that is current and usable in the digital terrestrial television broadcast. All the necessary documentation and approval procedures shall be submitted to the Authority for approval with the STB.