



Standards for Operation of the Digital Cable Television Broadcasting System

འབྲུག་བརྗོད་རྒྱུ་འགྲུལ་དང་བརྗོད་སྐབས་འཕུལ་འཕེལ་ལྷན་ཁང་།

**Bhutan InfoComm and Media Authority
Royal Government of Bhutan
Thimphu, Bhutan**

Contents

Preliminary	1
1.1 Legal basis.....	1
1.2. Title and Commencement.....	1
1.3. Scope of Application.....	1
1.4. Amendment.....	1
1.5. Definitions	1
Standards for operational aspects of the digital cable television system	3
2.1 Provisioning of the Digital Cable television services	3
2.2 Database of the subscribers.....	3
2.3 Billing for subscribers	4
Standards for the Digital Cable television system	5
3.1 Digital Standard.....	5
3.2 Conditional Access system (CAS).....	5
3.3 Receiver Technical Specifications	7
3.4 Set-top Box (STB)	7
Annexure A: Technical Specification for Digital CAS system.....	9
Annexure B: Specification Requirements for the Set-Top-Box (STB)	11

Preliminary

1.1 Legal basis

In accordance with Section 51(3) of the Information, Communications and Media Act of Bhutan 2018 (“the Act”), the Bhutan InfoComm and Media Authority (“the Authority”) hereby issues these standards for Operation of the Digital Cable Television Broadcasting System.

1.2. Title and Commencement

These standards shall be called as the Standards for Operation of the Digital Cable Television Broadcasting System and shall come into force on the 08th of June, 2018 corresponding to the 24th of the fourth month of the Bhutanese Earth Male Dog Year.

1.3. Scope of Application

These Standards shall apply to all cable television operators planning to implement digital cable television system within the country as well as for the Multi-Service Operator (MSO).

1.4. Amendment

Amendment to this Standard shall be made according to the change in technologies, national priorities, policies and industry trends.

1.5. Definitions

Unless the context otherwise requires, the following words and terms used in this Standard shall have the following meanings assigned to them:

“Conditional Access System” means encryption and decryption of the programme material to ensure that broadcasting services are accessible by the only authorized subscribers.

“Descrambling” means the process of undoing the scrambling to yield intelligible pictures, sound and/or data services.

“Encryption” is the process of protecting the secret keys that have to be transmitted with the scrambled signal in order for the descrambler to work.

“Entitlement Control Message (ECM)” means a cryptogram of the control word and the access conditions. An ECM is a specific component of the electronic key signal and over-the-air addressing information. The ECMs are used to control the descrambler and are transmitted over-air in encrypted form.

“Entitlement Management Message (EMM)” means a message authorizing a viewer to descramble a service. An EMM is a specific component of the electronic key signal and over-the-air addressing information. The EMMs are used to switch individual decoders, or groups of decoders, on or off and are transmitted over-air in encrypted form.

“Scrambling” refers to an electric process applied to continually change the form of broadcast signal so that, without a suitable decoder and electronic keys, the signal is made unintelligible.

“Multiplex” is a process of assembling of all the digital data that is carrying one or more services within a single physical channel.

“Set-top-box” is the device that enables a subscriber to view pay channels. This instrument decodes signals from the cable operator for viewing a pay channel. It can also monitor the number and duration of channels viewed by the subscriber.

“Scrambling” refers to an electric process applied to a signal to make it unintelligible except by receivers owned by domestic viewers or receivers that protect rights associated with the broadcast programming.

“Subscriber Management System (SMS)” refers to system which will manage the subscribers including sending out bills and receiving payments from viewers.

Standards for operational aspects of the digital cable television system

2.1 Provisioning of the Digital Cable television services

- 2.1.1 Cable operators shall only commence their digital cable services after obtaining prior approval of the Authority.
- 2.1.2 Cable operators shall provide digital cable service to any person making such a request, within their area of operation.
- 2.1.2 If the cable operator is not able to provide the requested digital cable service due to technical and operational non-feasibility, then such shortcoming shall be communicated in writing to the applicant within two days of the receipt of the request.
- 2.1.3 No cable operator shall disconnect the cable services to a subscriber without giving prior notice of at least fifteen (15) days indicating the reasons for disconnection. The period of fifteen days shall be considered from the date of receipt of the notice of disconnection by the subscriber.
- 2.1.4 If the services to a subscriber have been discontinued by cable operator, as the case may be, on their own or upon the request of the subscriber or for any other reason, no reactivation charges for resumption of the cable service shall be levied to the subscriber.
- 2.1.5 If the cable service to a subscriber is required to be disrupted for facilitating preventive maintenance, the cable operator as the case may be, shall give a prior notice of at least a day to the subscriber if the disruption of the cable service likely to extend up-to twenty four hours.
- 2.1.6 In case the disruption in the supply the cable service is likely to continue for a period exceeding twenty four hours, the cable operator, as the case may be, shall give prior notice of at least seven days to the subscriber.

2.2 Database of the subscribers

- 2.2.1 Cable operators shall ensure to maintain database of its subscribers as per the format prescribed by the Authority. Such data shall be maintained area-wise and must be submitted to the Authority on quarterly basis. The format is provided as Annexure A.

2.3 Billing for subscribers

2.3.1 The cable operator shall:

- a) Offer cable television service either on pre-paid or post-paid payment basis to its subscriber and accordingly the bills/receipts for the subscribers shall be generated.
- b) Give to every subscriber the bill for charges due and payable by such subscriber for each month or for such other period as agreed between the parties.

2.3.2 In case of post-paid bills, the subscriber shall be billed on monthly basis and the bill shall contain the entrainment tax amount payable to the Department of Revenue and Customs, Ministry of Finance.

2.3.3 The Entertainment Tax shall be applied to every television set connected to the digital cable television system.

2.3.4 The monthly bill shall clearly indicate subscription fee, entertainment tax and other charges if applicable.

2.3.5 Cable operators shall issue a proper receipt for payments made by all subscribers.

Standards for the Digital Cable television system

3.1 Digital Standard

3.1.1 The European standard, DVB-C2 shall be followed for providing digital cable transmission system.

3.2 Conditional Access system (CAS)

3.2.1 In order to protect the broadcast programmes against unauthorized reception, the cable television service shall be distributed through the use of Conditional Access System (CAS).

3.2.2 The CAS for digital broadcasting service protecting either MPEG-2 or MPEG 4 transport stream package or MMTP package shall provide the service available to the authorized receiver only.

3.2.3 The conditional access system generally consists of two main subsystems:

- a) A scrambling and descrambling subsystem that scrambles the signal to prevent non-subscribers from receiving it and descrambles the signal at the subscribers' receivers.
- b) Conditional access sub-system (CASS) that processes access control messages to determine whether descrambling is to be performed. It is a detachable security module which is used as part of the CA system in a receiver. It is also possible to embed the security module in the receiver itself, in which case each receiver will typically have its own secret individual address. Replacement of the CASS is one means of recovering from a piracy attack. Replacement of the CASS also enables new features to be added to the system as and when they are developed.

3.2.4 The CAS shall have in place the Subscriber Management System to maintain the database of the subscribers including the billing.

3.2.5 The CAS shall support a wide range of charging and payment schemes such as:

- a) Subscription (pre-payment for a time period of viewing);
- b) Pay-Per-View (payment for a programme or group of programmes);
- c) Impulse Pay-Per-View (payment for a programme or group of programmes without advance notice).

3.2.5 Technical Specifications for Scrambling and Access control sub-systems

a) Scrambling subsystem

- i. The scrambling of the information before broadcasting shall be carried out using cipher encoding to original broadcast bit-stream followed by descrambling at the receiving end with the same cipher decoding to recover the original bit-stream.
- ii. Scrambling procedure shall be of either:
 - For 64-bit encoded sequences, the original encoding is replaced with another binary code string using 64- and 256-bit variables.
 - For code strings of less than 64 bits, the method used to generate a series of pseudo-random encoded sequences, which are combined to create the scrambled signal.

b) Conditional Access Subsystem (CASS) includes Entitlement Control Messages (ECMs) for program and control information, the Entitlement Management Messages (EMMs) for individual information, common and individual messages.

- i. The Entitlement Control Messages (ECMs) shall provide scrambling key to descramble the protected service. The Access on the scrambling key in the ECM shall be controlled by means of entitlement or rights, provided in the Entitlement Management Messages (EMMs).
- ii. To validate and provide the entitlement required to descramble the protected service, Entitlement Management Message (EMM) shall be used. EMMs shall provide key to provide encryption and decryption of the scrambling key. The EMMs shall either be distributed over the broadcast or by other media.
- iii. ECMs shall be transmitted using the MPEG-2 system section format at a minimum interval of once every 100 ms in order to improve the receiver's tuning response speed.
- iv. EMM shall be transmitted using the MPEG-2 system section format.

3.2.6 Specification requirements for the CAS shall be as per the specification mentioned in Annexure A.

3.3 Receiver Technical Specifications

3.3.1 At the receiving end, the security functionality shall be either:

- a) Carried out together with the descrambling functionality; or
- b) Detachable (for example smart card) along with the descrambling functionality. Here all functions performing input data stream restorations shall be implemented in a detachable module and communicate with the receiver through standardize interface.

3.2.9 The Security functionality shall either be in the form of:

- a) Preliminary instruction , if present (e.g. password or user acceptance) ;
- b) Operational instructions using the security module;
- c) Result processing (e.g. delivery of scrambling word)

3.4 Set-top Box (STB)

3.4.1 The Set-top-box (STB) shall meet the following standards:

- a) Performance standard
 - i. The STB shall support the reception and processing of the EN 300429 (DVB-C) compliant digitally modulated signals. It shall be able to receive and process service information (SI) as laid down in EN 300468 and ETR 211.
 - ii. The STB shall be able to receive data bit stream compliant to EN 301192 and ETSI TR 1012. This standard is for data service if implemented by the service providers.
 - iii. The STB shall either support a smart card/card-less CAS solution.
 - iv. The STB shall support the “Hardware root of trust” concept by locking each STB uniquely to the CAS embedded in a secured chipset.
- b) Video and Audio Decoding standard
 - i. The STB’s video decoder shall:

- Fully comply with the DVB implementation guidelines for the use of the MPEG -2 (SDTV) and MPEG-4 H.264/AVC (HDTV) video in the cable ETSI TS 101154,
- Ensure synchronization between audio and video and the audio shall never lead the video programme by more than 20 milliseconds nor lag the video by more than 45 milliseconds, and
- Be able to switch between 4:3 and 16:9 picture aspect ratios.

ii. The STB's audio decoder shall:

- Fully comply with the DVB Implementing Guidelines for the use of MPEG-2 system, video and audio in satellite and terrestrial broadcasting applications ETSI TS 101154,
- Support reception of multi-channel (up to 5.1) audio, in addition to the mandatory SDTV audio decoder requirements,
- Provide at least one stereo audio decoder that is able to meet minimum decoding requirements, based on MPEG 1 Layer II ("Musicam" ISO/IEC 11172-3), and
- Fully support decoding of audio in modes such as dual, mono, stereo and joint stereo.

c) Electronic Programme Guide

The STB shall be able to provide a complete list of channels and the electronic programme guide containing all event information for all programme channels on the available multiplexers.

d) Specification requirements for the Set top box shall be as per the specification mentioned in Annexure B.

Annexure A: Customer base data

Name of the Cable Operator:

Total number of Subscriber:

Date of Submission:

Sl	Area of Operation	Name of the location	Number of customers

Signature of the cable operator

Annexure B: Technical Specification for Digital CAS system

SI	Parameters	Requirements
1	Modulation	<ul style="list-style-type: none"> • Either single carrier QAM modulation or • Orthogonal Frequency Division Multiplex (OFDM)
2	Forward Error Correction	<ul style="list-style-type: none"> • Low density parity check (LDPC) code as inner code and Bose Chaudhuri Hoquenghem (BCH)code as the outer code
3	Input	
	DVB- C RF	<ul style="list-style-type: none"> • F- head • Frequency range: 47 ~870 MHz
4	Out put	
	Decode mode	MPEG- 2 TS
5	Video signal	
	Decoder format	NTSC/PAL
	Decode frame frequency	30/25
	Decode Image Resolution	720x576(PAL), 720x480 (NTSC)
	Output level	1,0Vp, 75 Ω
6	Audio Signal	
	Decode Audio Mode	Stereo or dual-mono
	Decode mode	MPEG -1 Layer 2
7	ASI	DVB standard, BNC Interface

Annexure C: Specification Requirements for the Set-Top-Box (STB)

Sl	Parameters	Requirements
1	Electrical specifications:	
	a) Input voltage range	170 – 250V AC
	b) Frequency	50 Hz ± 5 per cent
2	Connector	
	a) RF Input	75 ohms impedance. Female connector as per IEC 60169-24
	b) Output video	1 X RC A type CVBS
	c) Output audio	2 X RCA type
	d) RF Output	75 ohms impedance. Male connector as per IEC 60169-24
	e) Digital a/v output	HDMI
3	RF Characteristic of signal	
	a) Modulation	16 to 256 QAM
	b) Symbol Rate	0.87 – 6.9 Mbuad
	c) Modes	Constant Coding and Modulation
	d) Frequency	8 MHz
	e) C/N range	31 dB Min. for 64 QAM
	f) Interleaving	Bit interleaving
	g) Constellations	16 QAM, 64 QAM and 256 QAM
	h) Max Bit Rates (8MHz)	83.1Mbit/s
4	Channel tuner performance	
	a) Input level per carrier	37 dB μ V to 67 dB μ V for 64 QAM
	b) Input frequency range	47 MHz – 862 MHz
	c) RF input impedance	75 ohms
5	Decoder video format	MPEG -2 (SDTV) or MPEG-4 H.264/AVC (HDTV)
	a) Aspect ratio	4:3 , 16:9
6	Decoder Audio format	<ul style="list-style-type: none"> • MPEG 1 Layers 1,2 (ISO/IEC 11172-3) • MPEG 2 AAC (ISO/IEC 13818-7) • MPEG 4 AAC (ISO/IEC 14496-3)
7	Main CPU	<ul style="list-style-type: none"> • Supporting MPEG 2, MPEG 4 (H.264), H.265(HEVC), MPEG AAC, MPEG Audio Codec
	a) Memory	At least 8MB Flash and 128 MB SDRAM
8	Remote Control	Dual Mode (TV and STB)
9	Language of operation	English