



## INDIAN STANDARD SET TOP BOX SPECIFICATIONS

*The BIS specifications for Analog and Digital Set Top boxes have now been formally released. SCaT takes a close look and explains its requirements and implications.*

The Bureau of Indian Standard (BIS) is the government body that lays out the various Indian Standards. A comprehensive range of Indian Standards have already been formulated for most Cable TV hardware. The Cable Act in-fact requires hardware deployed on Indian Cable TV networks must conform to these standards.

The Lok Sabha had cleared an amendment to the Cable Act that proposed to make the use of an addressable system compulsory for delivery of pay channels. This amendment was also passed by the Raj Sabha on 10th December 2002. The passing of the legislation in both houses paves the way for its formal declaration as an amendment to the Cable Act, over the next 4 to 6 weeks.

Since the law requires that all addressable systems on Indian Cable TV Networks must conform to the BIS specifications, it is important to be familiar with the specifications.

### ANALOG & DIGITAL

The BIS has formulated 2 separate specifications.

The IS 15244: 2002 is the Indian Standard: Analog Set Top Box - Specification.

The IS 15245: 2002 is the Indian Standard: Digital Set Top Box - Specification.

While several of the other CATV hardware specifications have been derived from European (IEC) specifications, the Set Top Box (STB) specifications have been formulated from scratch since no other country has dictated specifications for these devices.

### BROAD STANDARDS ONLY

The Set Top Box is similar to a lock and key arrangement which permits only a single, authorised user access. To maintain this exclusive access, each lock and key combination needs to be unique. Various manufacturers have created their own unique designs of locks and keys and boast that their lock and key combination is unbeatable. It would be self defeating if the government dictated a universal specification for all locks and keys !

A similar situation exists for STBs.

### NOT INTER-OPERABLE

As explained above, the BIS has not dictated a specific scrambling (locking) system. This will avoid any monopolisation of what could possibly emerge as one of the worlds largest markets for Set Top Boxes.

The BIS standards however, do specify general guidelines as well as technical parameters to ensure that the boxes interface with all cable TV networks that meet BIS specifications, as well as with B&W and Colour TV sets including legacy TV sets with mechanical tuners capable of receiving VHF transmissions only.

### COMMON SPECIFICATIONS

The I.S. 15244 (for Analog STBs) & I.S. 15245 (for Digital STBs) have identical general requirements such as those relating to the interface with Cable TV networks & customer devices such as TVs, VCRs etc. Safety requirements, Electro Magnetic Compatibility (EMC), Marking, Environmental Tests, as well as Transportation test such as Bump and Drop as well as operating life tests are identical for both, Analog and Digital STBs. Hence, we will collectively review these common specifications below.

Only the performance requirements are obviously different for Analog and Digital STBs. These are indicated separately in Tables 1 & 2.

Table 1 Digital STB Performance Requirements

Sr. No.	Parameters	Requirements
i)	Electrical Specifications: a) Input voltage range b) Frequency	90-270 V AC 50 Hz $\pm$ 5 percent
ii)	Bypass of analog free to air RF signal	The STB shall have the capability of bypassing free to air RF signal
iii)	Connectors: a) RF input b) Output video c) Output audio (L and R) d) RF output	75 ohms impedance, female connector (as per IEC 60169 – 2) 1 X RCA type 2 X RCA type 75 ohms impedance, female connector (as per IEC 60169 – 2)
iv)	RF characteristics at cable system outlet: a) System b) Modulation c) RF carrier signal level  d) Carrier level differences between distributed TV channels (47 to 862 MHz range) e) Amplitude response within a TV channel  f) Lowest carrier to interference ratio g) Cross modulation h) Digital video RF characteristics	PAL B (for VHF), PAL G (for UHF) AM-VSB 60 dBu V, <i>Min</i> 57dBuV, <i>Min</i> for systems with 8 MHz 80 dBuV, <i>Max</i> 77 dBuV, <i>Max</i> for >20 channels 12 dB, <i>Max</i>  Variation (pp): 8 dB, <i>Max</i> Slope of variation : 1.5 db/MHz, <i>Max</i> 35 dB, <i>Min</i> for 64 QAM >46 + 10 lg (N-1), N = Number of channels Constellations of 16 QAM, 64 QAM and 256 QAM are desirable. Other constellation (32 QAM and 128 QAM) may also be used. The constellations used shall be automatically detected
v)	Channel tuner performance characteristic: a) RF input level b) Input frequency range c) RF input channel bandwidth d) RF input impedance e) RF input return loss f) Frequency assignment download	Same as mentioned in RF characteristics at cable system outlet in (iv) 47 to 862 MHz 7 MHz 75 ohms 6 dB, <i>Min</i> Optional
vi)	RF re-modulator output: a) Modulation format b) RF output channel c) RF output level d) Carrier to noise ratio	PAL: B (for VHF); PAL G (for UHF) VHF Channel 3/4; Agile/UHF 60 dBu V, <i>Min</i>  44 dB, <i>Min</i>
vii)	Remote control	Optional
viii)	Operating temperature range	0 deg. C to 50 deg. C
ix)	Operating humidity range	5 percent to 95 percent (non-condensing)
x)	Finger printing	Essential but manufacturer/service provider free to choose mechanism

**FTA USE**

An important requirement is that all STBs - Analog or Digital, must have a facility that will permit the user to view Free-To-Air analog CATV RF signals that are carried as part of the compulsory basic tier bouquet.

**OPERATING FREQ. BAND**

Both Analog and Digital STBs are required to operate from 47 MHz to 862 MHz with a minimum input level of 60 dBu upto 300 MHz and 57 dBu for frequencies above 300 MHz i.e. in the UHF band where the inter channel spacing shifts to 8 MHz (PALG). The Set Top Boxes must accommodate a maximum input level of 80 dBu for less than 20 channels or 77 dBu for more than 20 channels. All other details such as carrier level differences, amplitude difference within a TV channel, RF input return loss and carrier to noise ratios are as defined by other corresponding BIS specifications for Cable TV equipment (IS 13420 Part 1 & IS 14231 Part 3)

**RETURN PATH**

IS 15244 & IS 15245 permit use of the return path by the Set Top Box. The return path signals must be in accordance with previously defined IS specifications (IS 14231 - Part 8)

**ANY SCRAMBLING**

The Set Top Box specifications permit the manufacturer or service provider to select and implement the conditional access system of their choice. This includes a proprietary scrambling system.

### SMART CARDS

The specifications state "The STB may have provision for Smart Card operation". If a smart card is incorporated, it must meet IS 14202 (Parts 1, 2 & 3)

### SMS

The I.S. standards permit the service provider to opt for any Subscriber Management System (SMS), as long as it ensures consumer interest by "efficient responsive and accurate billing and collection".

### OUTPUTS

To ensure easy interface with all types of TV Sets including old legacy TVs with only VHF, mechanical tuners, the BIS specifications require the Set Top Boxes to have a VHF channel 3/4 output for PAL B. For PAL G a frequency agile UHF output is required. The RF output must be through an IEC 60169-2 (TV female) connector.

The Set Top Boxes are also required to provide one video as well as left and right audio outputs on RCA connectors.

**Table 1 Analog STB Performance Requirements**

Sr.No.	Parameters	Requirements
i)	Electrical Specifications: a) Input voltage range b) Frequency	90-270 V AC 50 Hz $\pm$ 5 percent
ii)	Bypass of analog free to air RF signal	The STB shall have the capability of bypassing free to air RF signal
iii)	Connectors: a) RF input 75 ohms impedance, female connector b) Output video c) Output audio (L and R) d) RF output	(as per IEC 60169 - 2) 1 X RCA type 2 X RCA type 75 ohms impedance, female connector (as per IEC 60169 - 2)
iv)	RF characteristics at cable system outlet: a) System b) Modulation c) RF carrier signal level  d) Carrier level differences between distributed TV channels (47 to 862 MHz range) e) Carrier level differences between AM-VSB and 64 QAM digital signal adjacent channel f) Amplitude response within a TV channel g) Lowest carrier to interference ratio h) Cross modulation Slope of variation: 1 dB/MHz, Max	PAL B (for VHF), PAL G (for UHF) AM-VSB 60 dBuV, Min 57dBuV, Min for systems with 8 MHz 80 dBuV, Max 77 dBuV, Max for >20 channels 12 dB, Max 13 dB, Max (64 QAM signal must be below the level of adjacent AM-VSB channel) Variation (pp): 2 dB, Max 57 dB, Min >46 + 10 1g (N-1), N = Number of channels
v)	Channel tuner performance characteristic: a) RF input level  b) Input frequency range c) RF input channel bandwidth d) RF input impedance e) RF input return loss f) Frequency assignment download	Same as mentioned in RF characteristics at cable system outlet in (iv) 47 to 862 MHz 7 MHz 75 ohms 6 dB, Min Optional
vi)	RF re-modulator output: a) Modulation format b) RF output channel c) RF output level 80 dBuV, Max d) Carrier to noise ratio	PAL: B (for VHF); PAL G (for UHF) VHF Channel 3/4; Agile/UHF 60 dBuV, Min 44 dB, Min
vii)	Remote control	Optional
viii)	Operating temperature range	0 deg. C to 50 deg. C
ix)	Operating humidity range	5 percent to 95 percent (non-condensing)
x)	Finger printing	Essential but manufacturer/service provider free to choose mechanism

### **REMOTE CONTROL**

The provision of a remote control is optional.

### **FINGER PRINTING**

This is probably one of the most important requirements even though it is not commonly provided on Set Top Boxes worldwide. Finger printing is a facility whereby a STB, when commanded from the headend, outputs its unique identity (such as its serial number) on to the screen of the TV to which it is connected.

Finger printing is an effective anti piracy measure.

An unscrupulous last mile operator may install a bank of STB, each outputting unscrambling video and audio signals of various pay channels. These signals could then be re-modulated and fed out as a pirated, unscrambled bouquet. The Master Headend can, in such cases, activate finger printing and identify each of the errant STBs on the pirate network and shut them off.

It must be noted that the amendments to the Cable Act dictate that delivery of a pay channel without a conditional access system is a non bailable offence and attracts a jail sentence !

### **OPERATING VOLTAGE**

Considering a very wide voltage fluctuations over most of the country, the I.S. specifications require STBs to operate for any electrical input ranging from 90 VAC to 270 VAC.

Similarly, all STBs must operate over 0 to 50 deg. C.

### **ENVIRONMENTAL TEST**

To ensure reliable operations of the Set Top Box after transportation as well as to endure reasonable user abuse, the STBs need to be confirm to a drop test (IS 13252) Dry and Damp Heat Tests (IS 9000 Part 3/5 & Part 5/1) as well as Cold Test (Part 2/4).

### **SUMMARY**

The I.S. must be congratulated on putting out The BIS specs even before they have been mandated by law. The specs are reasonable and ensure reliable operation under Indian conditions. They also ensure that both Analog as well as Digital boxes are compatible with existing TV sets and CATV networks.

The STBs can employ any scrambling and billing system. Set Top Boxes from one network need not operate on any other network. This open standard will ensure that no monopoly is fostered into the market by law and that the law does not tilt in favour of any particular manufacturer or system.

The compulsory requirement of finger printing will go a long way in easily identifying errant STBs as well as trouble shooting. The IS 15244 & 15245 lay the ground work for an open architecture STB where all manufacturers are invited to compete and establish their own niche in a huge pay TV market.