# HDTV - IRD GUIDELINES AUSTRIA

**Version 3.1 - 1 September 2010**

# Notice

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# 1 INTRODUCTION

## 1.1 Scope

This document outlines a set of minimum requirements for HDTV IRDs (integrated receiver decoders), conditional access modules and TV sets with an integrated HDTV IRD used for receiving SD (standard definition) and HD (high definition) satellite television programmes distributed by ORS for the Austrian market.

Exceptions for HDTV IRDs which are integrated into TV sets are set out explicitly within the affected clause.

Requirements which apply only to HDTV IRDs with PVR or PVR-ready functionality are explicitly outlined.

This guideline defines only a minimum set of requirements and is not intended to be a complete specification for HDTV IRDs. It lists the minimum requirements for receiving digital audio and/or video in either standard or high definition, and/or data services distributed via satellite.

## 1.2 Document History

| Version | Date | Comments |
|---------|------|----------|
| 0.1 | 12.11.2007 | Initial version. |
| 0.2 | 19.11.2007 | Draft version. |
| 0.3 | 22.11.2007 | Modifications after 1st review. |
| 0.4 | 26.11.2007 | Modifications after 2nd review. |
| 0.5 | 07.12.2007 | HDCP Specification |
| 1.0 | 08.01.2008 | Changes regarding content protection. Release version. |
| 2.0 | 02.06.2009 | Changes regarding the Irdeto CA system, merging with the SDTV IRD guideline and additional requirements for the smart card agreement |
| 2.1 | 16.02.2010 | Cryptoworks no longer supported.<br>Requirement for channel list management added.<br>General requirements adapted.<br>PVR feature added.<br>AC3 handling defined.<br>Composite interface added. |
| 2.3 | 09.03.2010 | Requirements for TV sets with integrated IRD |
| 2.4 | 24.03.2010 | Additional requirements for CI |
| 2.5 | 21.05.2010 | LCN added |
| 2.6 | 21.05.2010 | DRM & content protection added<br>Middleware |
| 2.7 | 31.05.2010 | HDTV basic requirements<br>Maturity rating |

| | | Operator pairing<br>DRM & Content protection via Irdeto ECM |
|---|---|---|
| 2.8 | 01.06.2010 | HDTV mandatory, SDTV-only no more specified |
| 2.9 | 07.07.2010 | DRM, CP, general rules adapted |
| 3.0 | 23.08.2010 | Analogue interfaces not mandatory, final clean version 3 |
| 3.1 | 01.09.2010 | Irdeto no longer required for storage encryption<br>Proof-reading |

## 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　Definitions

### AVC

Advanced video coding a standard for video compression. See also H.264

### BAT

Bouquet association table

### CA

Conditional access system

### CAM

Conditional access module: standardised interface between a host device (e.g., a set-top box or DTV) and a removable security module.

### CI

Common interface

### CI+

Common interface plus

### CSA

Common scrambling algorithm

**CIM**

Common interface module

**DRM**

Digital rights management

**DVB**

Digital Video Broadcast: The digital video broadcasting (DVB) project is an industry-led consortium of over 270 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others, based in over 35 countries and committed to designing open technical standards for the global delivery of digital television and data services. (www.dvb.org)

**DVR**

Digital video recorder: an IRD which is capable of recording the content of a DVB transport stream on the IRD internal data storage or an external data storage device.

**EIT**

Event Information Table

**EPG**

Electronic Program Guide

**EPG schedule**

A time schedule which shows the upcoming events for the next few days for one or more channels on a structured graphical user interface.

**H.264**

H.264 is a standard for video compression. It is also known as MPEG-4 Part 10, or MPEG-4 AVC (for advanced video coding).

**HDCP**

High-bandwidth digital content protection

**HDTV**

High definition television

**HDMI**

High definition multi-media interface

**IRD**

Integrated receiver decoder

**IRD vendor**

The IRD vendor is understood to be the contractor of ORS, who is contracted to import and resell IRDs in the Austrian market in compliance with these guidelines.

**LCN**

Logical channel numbering

**Mb**

Megabit

**MPEG**

MPEG, which stands for moving picture experts group, is the name of a family of standards used for coding audiovisual information (e.g., films, video, music) in a digital compressed format. (www.mpeg.org)

**NIT**

Network information table: provides information about the physical network TM2451R2

**PiP**

Picture in picture: the simultaneous display of two independent live video sources on one screen.

**PID**

Program identifier

**PMT**

Program map table defined in ISO/IEC 13818 1. The PMT identifies and indicates the locations of the streams that make up each service, and the location of the Program clock reference fields for a given service

**PVR**

Personal video recorder (see DVR)

**SCART**

SCART (from Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs) is the name of a French-originated standard and the associated 21-pin connector for connecting audio-visual (AV) equipment together and transmitting analogue signals.

**SDTV**

Standard-definition television

**SDT**

Service description table: contains data on the services in the system, e.g. names of services, the service provider, etc.

**SGT**

Service guide table

**SI**

Service information: digital data describing the delivery system, content and scheduling/timing of broadcast data streams etc. It includes MPEG 2 PSI together with independently defined extensions.

**TS**

Transport stream. See also ISO/IEC 13818 1 [1]. A data stream carrying one or more MPEG programmes.

**TV set**

The term "TV set" describes within this document the integrated combination of an IRD and a display.

**USB**

Universal serial bus (USB) is a serial bus standard used to interface devices

## 1.5      References

| [1] | DVB A 011 | DVB A 011 Common Scrambling Algorithm. DVB Blue Book A011. |
|---|---|---|
| [2] | ETSI EN 300 421 v1.1.2 | Digital Video Broadcasting (DVB); Digital broadcasting systems for television, sound and data services: Framing structure, channel coding and modulation for 11/12 GHz Satellite services. |
| [3] | ETSI EN 302 307 v1.2.1 | Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications. |
| [4] | IEC 60169-2 | Radio-frequency connectors, Part 2: Coaxial unmatched connector |
| [5] | ETSI TS 101 154 v1.9.1 | Digital Video Broadcasting (DVB); Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream |
| [6] | ISO/IEC 13818-1 | Information technology - Generic coding of moving pictures and associated audio information. Part 1: Systems. |
| [7] | ISO 639-2 | Code for the representation of names of languages |
| [8] | ITU-T V.92 | Enhancements to Recommendation V.90 |
| [9] | ETSI EN 50049-1 | Domestic and similar electronic equipment interconnection requirements: Peritelevision connector |
| [10] | ETSI EN 50157-2-1 | Domestic and similar equipment interconnection requirements: AV.link-Part 2-1: Signal quality matching and automatic selection of source devices |
| [11] | ETSI EN 300 468 v1.11.1 | Digital Video Broadcasting; Specification for Service Information (SI) in DVB Systems |
| [12] | ETSI TR 101 211 v1.9.1 | Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI) |
| [13] | ETSI TS 102 006 | Digital Video Broadcasting (DVB); Specification for System Software Update in DVB Systems |
| [14] | ETSI EN 300 472 v1.3.1 | Digital Video Broadcasting (DVB); Specification for conveying ITU-R System B Teletext in DVB bitstreams |
| [15] | ETSI ETR 289 | Digital Video Broadcasting (DVB); Support for use of scrambling and Conditional Access (CA) within digital broadcasting systems. |
| [16] | ETSI TS 102 201 v1.2.1 | Digital Video Broadcasting (DVB); Interfaces for DVB Integrated Receiver and Decoder (DVB-IRD) |
| [17] | Universal Serial Bus | Universal Serial Bus (USB) Specification, Revision 2.0, April 27, 2000. |
| [18] | ITU-R BT.653-3 | Teletext systems |
| [19] | ETSI EN 300 743 v1.3.1 | Digital Video Broadcasting (DVB); Subtitling systems |
| [20] | ETSI EN 50221 | Common Interface Specification for Conditional Access and other Digital Video Broadcasting Decoder Applications |
| [21] | ETSI TS 102 825 | Digital Video Broadcasting Content Protection & Copy |

| | | Management (DVB-CPCM) |
|------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| [22] | EBU Tech 3333 | EBU HDTV Receiver Requirements, March 2009 |
| [23] | CI Plus Specification v1.2 | CI Plus Specification v1.2 |
| [24] | Logical Channel Numbering (LCN) Scheme for Large DVB-S Platforms, V2.1 | ASTRA, Logical Channel Numbering (LCN) Scheme for Large DVB-S Platforms, Technical Specification V2.1; 22nd June 2009 |
| [25] | ETSI TS 102 796 v1.1.1 | Hybrid Broadcast Broadband TV (HbbTV) |
| [26] | Softcell 3 DVB Client | Irdeto, Softcell 3 DVB Client, Integration Guide |
| [27] | HDMI Specification v1.3 | HDMI Licensing LLC, High-Definition Multimedia Interface Specification Version 1.3 |

# 2 GENERAL REQUIREMENTS

Compliance with general EBU requirements for HDTV receivers as described in EBU Tech 3333 [22] is recommended.

Compliance with the general requirements of applicable European Community directives is mandatory (CE marking).

The user shall be able to store preferences in the persistent memory of the HDTV IRD.

If the HDTV IRD is switched on from standby mode, the HDTV IRD shall tune to the last viewed service.

# 3 HARDWARE REQUIREMENTS

## 3.1 Satellite tuner and demodulator

### 3.1.1 General

The HDTV IRD shall include one tuner/demodulator unit to receive signals from a satellite RF outdoor unit.

The HDTV IRD should have an RF bypass (RF in - RF out). *(Not required for TV sets)*

### 3.1.2 RF/IF characteristics

The available transponder bandwidths and transponder powers vary with the different satellites. Consequently, a range of symbol rates and forward error correction rates may be employed.

The HDTV IRD shall accept incoming digital DVB signals which comply with DVB-S, as specified in ETSI EN 300 421 [2], and which comply with DVB-S2, as specified in ETSI EN 302 307 [3] (application area: broadcast services).

The HDTV IRD shall accept symbol rates on the incoming carrier up to 45Mbd in case of DVB-S signals and 10Mbd to 30Mbd in case of DVB-S2 signals.

### 3.1.3 Demodulation and error correction

Demodulation and error correction shall be performed for all symbol rates given above and for all error correction rates specified in ETSI EN 300 421 [2] and ETSI EN 302 307 [3] (application area: broadcast services).

The HDTV IRD shall support QPSK and 8PSK Demodulation as specified in ETSI EN 300 421 [2] and ETSI EN 302 307 [3] (application area: broadcast services).

The HDTV IRD shall support DVB-S compliant FEC (Viterbi) and advanced modulation LDPC/BCH FEC as specified in ETSI EN 300 421 [2] and ETSI EN 302 307 [3] (application area: broadcast services).

## 3.1.4      Input frequency range/tuning range

The input frequency band of the RF unit with antenna may cover the frequency range 10.7GHz to 12.75GHz for each of two polarisations. The RF unit may be configured to select and convert any of the four 1 GHz bands (upper or lower half band for each polarization) to IF.

The IRD shall be able to tune to any DVB carrier located within the IF band 950-2150 MHz with characteristics and symbol rate as specified in section 3.1.2.

## 3.1.5      Tuning/scanning procedures

### 3.1.5.1      General

The HDTV IRD shall provide basic information regarding signal strength and reception quality in a submenu of the HDTV IRD configuration menu.

The HDTV IRD shall provide a scanning procedure over the whole frequency range.

The HDTV IRD should use the scanning procedure to access the services available on the network.


The HDTV IRD shall have at least the following channel list:

1.      ORF 1 HD  <HDTV version>
2.      ORF 2 HD  <HDTV version>

         or

         ORF 2     <SDTV version*>
3.      ……


* During the initial setup process of the HDTV IRD, the user should be able to select one of the nine SDTV regional ORF 2 services:

ORF 2 Burgenland

ORF 2 Kärnten

ORF 2 Niederösterreich

ORF 2 Oberösterreich

ORF 2 Salzburg

ORF 2 Steiermark
ORF 2 Tirol
ORF 2 Vorarlberg
ORF 2 Wien

In cases where the HDTV IRD vendor provides and maintains a proprietary channel list service either through its own means or through a third party provider, the HDTV IRD vendor shall guarantee that the ORF channels always feature in the channel list, as required by ORF.

Any changes to the ORF channels in the channel list requested by ORF - e.g. deleting, adding, renaming, repositioning, etc. – shall be handled by the HDTV IRD vendor and its third party channel list provider instantly, so that the channel list reflects the demands of ORF at all times.

### 3.1.5.2    Logical channel numbering (LCN)

The HDTV IRD should support logical channel numbering as described in the technical specification "Logical channel numbering (LCN) scheme for large DVB-S platforms, technical specification v2.1" [24], released by SES ASTRA.

In cases where LCN according to [24] is supported the HDTV IRD shall be able to decode the following extension to the specification:

The ORS-specific SGT is broadcast on one (or more) ORS transponder(s). The entry point is the NIT of one (or more) ORS transponder(s). The NIT of the ORS transponder(s) carries one (or more) linkage descriptor(s) with the linkage type 0x91. These/this linkage descriptor(s) point to the transponder(s) carrying the SGT.

The LCN channel list should be offered to the customer at least as an option in addition to any HDTV IRD vendor's specific channel list.

Manual changes to the channel list:

Within the channel list view, users shall have the right to manually change the order of channels and insert, replace or delete channels at their own discretion and therefore manually change the mapping of channel numbers to channel names. In such cases however, the HDTV IRD shall provide an option in the HDTV IRD setup menu to reset the mappings to the default and currently signalled channel list.

Automatic update of the channel list:

The HDTV IRD shall be able to detect a change in the channel list due to the currently active signal, e.g. a change in technical parameters. This change shall result in the channel list view being immediately updated or the user shall receive an on-screen dialog allowing them to accept or refuse such an update of the channel list view.

The HDTV IRD shall remember the manual changes made to the channel list view by the user and react accordingly to the current signal.

In cases where the HDTV IRD provides user-defined service lists, these lists shall only be affected by LCN functionality if the user confirms the changes beforehand.

### 3.1.5.3    Dynamic NIT and SDT processing

The HDTV IRD should update the modulation parameters according the NIT.
Dynamic changes of service names in SDT shall be supported.

### 3.1.5.4    Dynamic PMT processing

The HDTV IRD shall be able to handle dynamic changes in the program map table (PMT).

An example of a practical use scenario for dynamic PMT changes is a broadcaster's requirement to make it possible to switch on and off regional variants of programs.

The HDTV IRD shall handle dynamic PMT changes in the correct manner and certain additional restrictions shall also be observed:

- o   Dynamic changes in the PMT shall not produce any disturbances in the audio/video output.
- o   In cases where switching of elementary audio and/or video streams is triggered, the maximum switching time (measured from PMT update to clear picture) shall be 3 seconds. The maximum switching time shall be met regardless of whether or not the elementary streams are scrambled.

It is recommended, that the video stream should freeze until the new video stream can be displayed.

The HDTV-IRD shall be able to handle a dynamic switchover from an H.264/AVC HDTV elementary stream to an H.264/AVC SDTV elementary stream. The maximum outage shall be less than 3 seconds.

### 3.1.6        Satellite tuner interface and signal levels

#### 3.1.6.1        RF input connector

The HDTV IRD shall include one input connector, type: IEC 60169-2 [4], F-type, female, 75 ohms.

#### 3.1.6.2        RF output connector

The HDTV IRD should include one output connector, type: IEC 60169-2 [4], F-type, female, 75 ohms.

The RF output shall be available independently from the operational status of the HDTV IRD (operational or stand by), so that there is no restriction on the operation of the connected equipment.

#### 3.1.6.3        Signal level

The HDTV IRD shall accept input signals with a level within the range -25dBm to -60dBm.

#### 3.1.6.4        Power supply and control signals of the RF unit

The HDTV IRD shall provide a power supply and control signals to the external RF unit as specified below:

o        Voltage: 13.5/18.5 V  +/- 5%

o        Current: at least 400 mA

o        Control tone:

▪        amplitude: 0.65 V +/- 0.25 V

▪        frequency: 22 kHz, duty cycle: 50% +/- 10%

The tuner/demodulator shall be able to select between at least two RF units, upper and lower band as well as polarisation within each unit.

The HDTV IRD should support the DiSEqC 1.0 specification.

## 3.2        MPEG-2 demultiplexer

### 3.2.1        General

The HDTV IRD demultiplexer shall be compliant with the MPEG-2 transport layer defined in ISO/IEC 13818-1 [6].

The HDTV IRD shall support ETSI TS 101 154 v1.7.1 [5].

Additional requirements:

The HDTV IRD shall interpret the Conditional Access (CA) descriptor as defined in ETSI ETR 289 [15].

The HDTV IRD shall be able to decode an ISO/IEC13818-1 [6] stream with data rates up to 58 Mbps.

The HDTV IRD shall be capable of utilising at least 32 elementary streams simultaneously, which requires 32 PID filters.

The HDTV IRD shall provide at least 32 section filters.

The HDTV IRD shall support variable bit rate elementary streams within a constant bit rate transport stream.

### 3.2.2      DVB descrambler

The descrambler unit shall be based on the common scrambling algorithm (CSA) as specified by DVB, see DVB A 011 [1].

The HDTV IRD shall be able to evaluate the CA descriptor regardless of whether it is inserted in the PMT at programme level or at programme element level.

## 3.3      Video decoding

The HDTV IRD video decoding subsystem shall comply with ETSI TS 101 154 v1.7.1 [5] and shall comply with ETSI EN 302 307 V1.1.2 [3]. Still pictures shall be supported in all modes listed below.

### 3.3.1      SDTV

#### 3.3.1.1      MPEG-2

The HDTV IRD shall comply with ETSI TS 101 154 v1.7.1 [5], Sub-clause 5.1, "25 Hz MPEG-2 SDTV IRDs and Bitstreams".

The minimum requirements are:

o      The HDTV IRD shall support MPEG-2 main profile main level bitstreams (MPEG-2 MP@ML).

o      The HDTV IRD shall support the decoding and display of video material with a frame rate of 25 Hz interlaced.

o      The HDTV IRD shall be able to decode bit-streams with 4:3 and 16:9 aspect ratios.

o      The HDTV IRD shall support a luminance resolution of 352x576 to 720x576.

o      A minimum bandwidth of 300kbps shall be supported.

### 3.3.1.2        H.264/AVC

The HDTV IRD shall comply with ETSI TS 101 154 v1.7.1 [5], Sub-clause 5.6.2, "25 Hz H.264/AVC SDTV IRD and Bitstream".

The minimum requirements are:

o        The HDTV IRD shall support decoding and displaying of H.264/AVC main profile level 3 bitstreams.

o        The HDTV IRD shall support the decoding and display of video material with a frame rate of 25 Hz interlaced or progressive.

o        The HDTV IRD shall be able to decode bitstreams with 4:3 and 16:9 aspect ratios.

o        The HDTV IRD shall support a luminance resolution of 352x576 to 720x576.

o        A minimum bandwidth of 300kbps shall be supported.

### 3.3.1.3        16:9 Letterbox conversion

It shall be possible for the user to switch the aspect ratio between 4:3 and 16:9 (adjustable in the user preferences submenu). *(Not required for TV sets).*

In cases where a 4:3 aspect ratio is preset in the HDTV IRD user preferences settings and video with an aspect ratio of 16:9 is to be displayed, the HDTV IRD shall automatically perform a 16:9 letterbox conversion. *(Not required for TV sets).*

TV sets shall display the video in the correct aspect ratio by adding pillar box or letterbox spacing.

## 3.3.2        HDTV

### 3.3.2.1        H.264/AVC

The HDTV IRD shall comply with ETSI TS 101 154 v1.7.1 [5], Sub-clause 5.7.2, "25 Hz H.264/AVC HDTV IRD and Bitstream".

The minimum requirements are:

o        The HDTV IRD shall support decoding and displaying of H.264/AVC high profile level 4 bitstreams.

o        The HDTV IRD shall support the decoding and display of video material with a frame rate of 25 Hz interlaced or progressive, or 50 Hz progressive.

o        The HDTV IRD shall be able to decode bitstreams with 16:9 aspect ratio.

- o The HDTV IRD shall support a maximum luminance resolution of 1920x1080.
- o A minimum bandwidth of 1 Mbps shall be supported.

The following HD video formats shall be supported:
- o 1280x720p/50
- o 1920x1080i/25

### 3.3.2.2 Downscaling from HDTV to SDTV

If the HDTV IRD is equipped with analogue video interfaces, the downscaled HDTV signal displayed on the analogue output shall be at least the same quality and resolution as the full resolution for a PAL SDTV signal. The aspect ratio conversion shall be handled as described in Clause 3.3.1.2.

The analogue output shall be controlled by the content security system as described in Clause 7.4.

## 3.4 Audio decoding

The HDTV IRD audio decoding subsystem shall comply with ETSI TS 101 154 v1.7.1 [5], in particular with Sub-clause 6 ("Audio") and its related annexes.

The HDTV IRD shall keep in sync the audio/video streams that are produced in order to achieve adequate lip-synchronization.

The audio decoder shall support the following audio coding systems:
- o MPEG-1 Audio Layer I and II
- o Dolby Digital (AC-3)

### 3.4.1 Multichannel audio

#### 3.4.1.1 Digital audio Interface

The HDTV IRD shall be able to output the audio stream in the native incoming audio format of the selected audio component on the digital audio interfaces (see Clause 3.5.4.2) in accordance with the requirements of clauses 3.5.2 and 7.4.

In the case of an AC-3 multi-channel audio stream, the audio format shall be optionally available as a stereo downmix on the digital audio interfaces

This clause is also valid for TV sets, in cases where a digital multichannel audio interface is available.

### 3.4.1.2 Analogue audio interface

If present, the AC-3 multi-channel audio stream shall be decoded to a stereo downmix and shall be fed to the analogue stereo output connectors (see Clause 3.5.4.1).

This clause is also valid for TV sets, in cases where analogue audio interfaces are available.

### 3.4.1.3 Dynamic audio component switching

In cases where the selected AC3 component is turned off inside the selected service during playback, the audio decoder shall automatically select one of the remaining audio components for digital and analogue output. During the switching period, the interruption should be shorter than 3 seconds.

## 3.5 HDTV IRD interfaces

## 3.5.1 SCART interface

The HDTV IRD should have one SCART interface or a Composite interface. *(Does not apply to TV sets).*

The SCART interface shall comply with ETSI EN 50049-1 [9] and ETSI EN 50157-2 [10].

This clause is also valid for TV sets, in cases where a SCART interface for video output is available.

## 3.5.2 Digital audio/video interface (HDMI)

The HDTV IRD shall have at least one HDMI output as described in ETSI TS 102 201 [16], Sub-clause 4.6. All digital Video Interfaces shall be compliant to the HDMI specification version 1.3 [27] or higher.

The HDTV IRD shall provide digital copy-protection at HDMI output as defined in the HDMI specification. The HDTV IRD shall provide for the user an option in the system menu to disable the HDCP authentication for unprotected content (see EBU Tech 3333 [22], §9.5). The HDMI source (HDTV IRD) shall attempt authentication if the content requires protection. A successful HDCP authentication shall always trigger encrypted transmission of the content.

If the content is signalled as digital copy-protected content and the HDCP authentication handshake is successful, then the HDCP command ENC_EN triggering the encrypted transmission of content shall be sent by the HDCP transmitter. If the content is signalled as digital copy-protected content and the HDCP authentication handshake fails at any time during the transmission, then unencrypted (clear) content shall not be transmitted.

Clause 3.5.2 is also valid for TV sets, in cases where an HDMI interface for video output is available.

### 3.5.3 Component video (YPbPr)

The HDTV IRD should have analogue component video output (YPbPr, RCA connectors). The analogue component video output shall support high-definition resolution.

The Clause 3.5.3 is also valid for TV Sets, in cases where a component interface for video output is available.

### 3.5.4 Audio interfaces

#### 3.5.4.1 Analogue audio

The HDTV IRD should have an analogue audio stereo output (left and right channel RCA connectors).

#### 3.5.4.2 Digital audio

The HDTV IRD shall have a digital audio S/PDIF output (electrical or optical connector).

Digital audio shall be available on all HDMI interfaces and S/PDIF outputs.

Clause 3.5.4 is also valid for TV sets, in cases where a component interface for video output is available.

### 3.5.5 Data interface

The HDTV IRD should support at least one of the following local data interfaces.

- o RS232C as defined in ETSI TS 102 201 [16], Sub-clause 4.7.1
- o Universal serial bus port, USB 2.0 [17]
- o LAN: Fast Ethernet IEEE 802.3u and/or WLAN 802.11g (or higher)

In cases where the HDTV IRD contains middleware as described in Clause 9, a wired or wireless LAN connection shall be supported.

## 3.5.6      DVB common interface

In cases where the HDTV IRD lacks an embedded Irdeto CA system as required by Clause 7.1, the HDTV IRD shall be equipped with at least one DVB common interface slot in compliance with the common interface specification ETSI EN 50221 [20].

In addition to ETSI EN 50221 [20], audio and video streams shall be scrambled at any point in the physical interface between the connected CA module and the HDTV IRD if the incoming stream is also scrambled.

The CA Module shall be capable of signalizing and activating any content protection and DRM functionality to the HDTV IRD as required in clauses 7.2 and 7.4 in a secure way that is not open to being circumvented.

The applied technology for realising this secure content exchange via CI may be based on the common interface plus specification v1.2 [23].

# 4      SERVICE INFORMATION

The HDTV IRD shall be able to process incoming MPEG-2 TS PSI and DVB SI data (descriptors, tables) in accordance with ETSI EN 300 468 v1.7.1 [11] and ETSI TR 101 211 v1.7.1 [12].

The HDTV IRD shall be able to process the DVB-SI tables for 'actual' and 'other' transport streams.

The following tables are a mandatory set of tables that the HDTV IRD shall be able to process: PAT, PMT, CAT, NIT, SDT, EIT, TDT, TOT

The HDTV IRD shall process the following EIT tables:

o      EIT actual (present/following/scheduled)

o      EIT other (present/following/scheduled)

The following descriptors in the EIT shall be processed by the HDTV IRD:

content_descriptor, short_event_descriptor, extented_event_descriptor.

The HDTV IRD shall process the copy control descriptor as described in Clause 7.4.

Descriptors or other data structures that are currently undefined or are unknown to the HDTV IRD shall be skipped and shall not cause any harm.

The HDTV IRD shall support an extended_event_decriptor of up to 1,000 characters per event. A minimum of 200 events per service shall be handled and shall be displayed in the EPG schedule.

# 5      NAVIGATOR AND EPG

The HDTV IRD shall implement a Navigator, allowing the user to control the operation of the HDTV IRD, and providing user access to system information (user preferences settings, system settings, facilities to initiate system software updates etc).

The Navigator is by definition part of the system software.

The Navigator shall support the German language in all menus and submenus.

The Navigator shall include a basic electronic programme guide which displays information extracted from relevant DVB-SI tables as described in Clause 4.

The HDTV IRD shall be able to read and use ISO 639-2 [7] language descriptors associated with the audio streams in the MPEG-2 transport stream ISO/IEC 13818-1 [6].

The user shall be able to set storable preferences for the default audio language. If an audio stream for the default audio language is available for the service the

HDTV IRD shall automatically choose that audio stream. In addition, the user shall be able to manually select from all audio streams available within the active service.

# 6 TELETEXT AND DVB SUBTITLING

## 6.1 Teletext

During normal operation (decoding of video/audio/data-streams), the HDTV IRD shall be able to demultiplex in parallel the teletext service transmitted in a packetised format in accordance with ETSI EN 300 472 [14].

The HDTV IRD shall be able to display teletext using the OSD. Teletext subtitles shall be displayed synchronous with video. The correct and dynamic display of teletext subtitles is mandatory.

The remote control shall have a "teletext" key.

### 6.1.1 Teletext data in the VBI

The insertion of the teletext data in the VBI of the analogue CVBS video output is recommended.

VBI insertion should conform to ITU-R BT.653-3 [18].

Clause 6.1.1 is also valid for TV sets, in cases where an analogue interface for video output is available.

## 6.2 DVB subtitling

The HDTV IRD should be capable of decoding and displaying DVB subtitle services which are transmitted in conformance with ETSI EN 300 743 [19].

The user shall be able to enable and disable subtitles through the user interface.

If both DVB-subtitling and teletext subtitling are received simultaneously, the HDTV IRD shall only display the DVB-subtitling stream.

# 7 CONDITIONAL ACCESS AND DIGITAL RIGHTS MANAGEMENT

## 7.1 Conditional access system

The HDTV IRD shall support conditional access (CA) in one of the following ways:

**Embedded CA system**

or

**Embedded CA system and one or more common interface slot(s) for CAMs**

or

**One or more common interface slot(s) for CAMs**

Each CI slot in the HDTV IRD shall be in compliance with the DVB common interface specification ETSI EN 50221 [20] and the additional requirements as described in Clause 3.5.6.

The CA system in use for Austrian public and commercial TV services is Irdeto with the CA system ID "0x0648".

The CA system ID should not be hardcoded into the firmware, but read from the smartcard instead.

The Irdeto embedded CA system has to be integrated according to Irdeto rules (see [26]) and the test procedure and licensing terms as defined by Irdeto have to be observed. This also applies to and is mandatory for any subsequent updates to the Irdeto CA system. The HDTV IRD vendor has to provide to ORS a written and certified proof that the HDTV IRD fulfils all requirements as stipulated in the specification for the Austrian market provided by the CA system vendor Irdeto.

In cases where the Irdeto CA system resides in a CA module, all requirements listed in clauses 7 and 8 shall be fulfilled in the same way as with an embedded Irdeto CA system.

## 7.2 Operator pairing

The CA system shall support operator pairing functionality based on the specification of the device manufacturer's guide to advanced security devices and the operator's guide to secure STBs provided by Irdeto.

This also applies to conditional access modules.

## 7.3    Maturity rating

The HDTV IRD shall support maturity rating as provided by the CA system provider listed in Clause 7.1.

## 7.4    Content security

The HDTV IRD shall support all content security features listed in this clause and its sub clauses either via an embedded CA system or via a CA system residing in a CAM module.

All signalling of copy-protection and DRM information shall be done within the ECMs of the CA system provider defined in Clause 7.1.

In the case of encrypted content, the HDTV IRD shall apply the copy-protection and DRM measures to the related service components as signalled in the ECMs.

In addition to the ECM-contained metadata, DRM and copy-protection information is also contained in the EIT by insertion of a copy control descriptor. The IRD should decode and display this information inside the information shown regarding the current/following programme and the EPG schedule.

In case of unencrypted content the HDTV IRD should support the requirements listed in EBU TECH 3333 [22], §9.7.

### 7.4.1    Signalling of copy-protection and DRM via EIT

In addition to the signalling of copy-protection and DRM information within ECMs, this information is also signalled in the EIT. For each event, a copy control descriptor may be available. The copy control descriptor shall be used by the HDTV IRD only for displaying DRM and copy-protection information to the user (e.g. inside an EPG).

For each event, a copy control descriptor as defined below can be inserted into the descriptor loop of the EIT. A private data specifier descriptor with its private data specifier set to 0x00000001 is signalled in advance of this copy control descriptor.

```
copy_control_descriptor() {
      descriptor_tag                        8 uimsbf 0xDE
      descriptor_length                     8 uimsbf
      descriptor_version                    8 uimsbf 0x00
      for (i=1; i++; i<descriptor_length){
```

```
            copy_control_byte                8 bslbf
        }
}
```

**Semantics for the copy control descriptor**:

**descriptor_tag:** The descriptor tag value is set to 0xDE.

**descriptor_length:** The descriptor length is an 8-bit field specifying the total number of bytes of the data portion of the descriptor following the byte defining the value of this field.

**descriptor_version:** This 8-bit field indicates the version of the syntax of the present descriptor. It shall be used by the receiving component to check its compatibility with the descriptor syntax.

**copy_control_byte:** This variable-length field contains copy control data. In the current specification, two copy control bytes are defined:

```
copy_control_byte{
        byte_A                               8 uimsbf
        byte_B                               8 uimsbf
}
```

**The bit allocation of the copy_control_bytes is as follows:**

```
byte_A {
  CI_service_blocking        1 bslbf //only used for CI+ modules
  CI_no_recording            1 bslbf //only used for CI+ modules
  trick_mode_control         3 bslbf // see 7.4.7
  CI_legacy_service_blocking 1 bslbf //only used for CI legacy
  digital_copy_protection    1 bslbf // see 7.4.2
  analog_copy_protection     1 bslbf // see 7.4.3
}

byte_B {
  storage_rights             3 bslbf // see 7.4.5
  storage_encryption         1 bslbf // see 7.4.6
  component_video_control    2 bslbf // see 7.4.4
  reserved                   1 bslbf // not used
  reserved                   1 bslbf // not used
}
```

## 7.4.2    Digital copy-protection

The activation of digital copy-protection is signalled in ECMs defined by the CA system provider listed in Clause 7.1.

If digital copy-protection is signalled as active, then copy-protection shall be enabled on all relevant digital interfaces. Please refer also to Clause 3.5.2.

In addition to the signalling of digital copy-protection within ECMs, digital copy-protection is signalled in the EIT/copy control descriptor as active by setting the digital copy-protection bit to 1.

### 7.4.3  Analogue copy-protection

The activation of analogue copy-protection is signalled in ECMs defined by the CA system provider listed in Clause 7.1.

If analogue copy-protection is signalled as active, then either all relevant analogue interfaces (see Clause 3.5.1) shall be disabled, or appropriate actions to prevent copying shall be taken (e.g. activation of Macrovision). However, this excludes the analogue video component interface, which is handled separately (see Clause 7.4.4).

In addition to the signalling of analogue copy-protection within ECMs, analogue copy-protection is also signalled in the EIT/copy control descriptor as active by setting the analogue copy-protection bit to 1.

### 7.4.4  Component video control

Restrictions regarding the analogue component video interface (YPbPr) are signalled in ECMs defined by the CA system provider listed in Clause 7.1.

The following analogue component video protection modes shall be supported:

- Enable analogue component video interface
- Disable analogue component video interface
- Downscale HDTV content formats to 576i

In addition to the signalling of component video control modes within ECMs, component video control is signalled in the EIT/copy control descriptor by setting the component video control bits in line with the following table:

| Bitmap | Component Video Protection |
|--------|----------------------------|
| 00 | No restrictions |
| 01 | Downscale HDTV formats to 576i |
| 10 | Disable component video interface |
| 11 | Reserved for future use |

### 7.4.5  Storage rights

In cases where the HDTV IRD has an internal or an external storage capability, the storage rights information shall be signalled in ECMs defined by the CA system provider listed in Clause 7.1.

The HDTV IRD shall be able to handle and observe the following storage rights:

- No restrictions on storage of content
- No recording allowed
- No recording except a temporary recording up to a 90 minute time shift buffer.

These storage rights shall be stored together with the content and shall be observed during subsequent playback of the content.

In addition to the signalling of storage rights within ECMs, storage rights are signalled in the EIT/copy control descriptor by setting the storage right bits in line with the following table:

| Bitmap | Storage right |
|--------|---------------|
| 000 | No restrictions |
| 001 | No recording except a temporary recording up to a 90 minute time shift buffer |
| 010 | No recording allowed at all |
| 011 | Reserved for future use |
| 100 | Reserved for future use |
| 101 | Reserved for future use |
| 110 | Reserved for future use |
| 111 | Reserved for future use |

## 7.4.6 Storage encryption

In case the HDTV IRD has an internal or an external storage capability, activation of storage encryption shall be signalled in ECMs defined by the CA system provider listed in Clause 7.1.

The HDTV IRD shall provide an encryption system for local encryption of content which is stored on an internal or external storage device.

The HDTV IRD shall provide a decryption system for local decryption of content, which was previously stored encrypted on an internal or external storage device.

In addition to the signalling of storage encryption within ECMs, storage encryption is signalled in the EIT/copy control descriptor as active by setting the storage encryption bit to 1.

## 7.4.7 Trick mode playback control

In case the HDTV IRD has an internal or an external storage capability, the restrictions on playback trick modes shall be signalled in ECMs defined by the CA system provider listed in Clause 7.1.

The HDTV IRD shall be able to handle and observe the following trick mode playback restrictions:

- No restrictions on trick mode playback.
- No skipping, fast forward limited to 2x speed, content stays visible.
- No skipping, fast forward limited to 4x speed, content stays visible.
- No skipping, fast forward limited to 8x speed, content stays visible.
- No skipping, jumping or fast forwarding allowed.

In addition to the signalling of trick mode playback within ECMs, permitted trick mode playback are signalled in the EIT/copy control descriptor by setting the trick play control bits in line with the following table:

| Bitmap | Trick mode control |
|--------|--------------------|
| 000 | No restrictions |
| 001 | No skipping, fast forward limited to 2x speed, content stays visible |
| 010 | No skipping, fast forward limited to 4x speed, content stays visible |
| 011 | No skipping, fast forward limited to 8x speed, content stays visible |
| 100 | Reserved for future use |
| 101 | Reserved for future use |
| 110 | Reserved for future use |
| 111 | No skipping, jumping or fast forwarding allowed |

## 7.5 General rules on content immutability

The subsequent clauses are required for service providers having additional needs in securing the immutability of their programme signals.

The HDTV IRD shall provide technical means to observe these requirements.

If the HDTV IRD provides middleware as defined in Clause 9 and, if the service provider of a certain programme signal accepts it, clauses 7.5.2 to 7.5.4 do not need to be observed.

### 7.5.1 No modification to programme signals

The HDTV IRD shall not allow the modification of the original programme signal by any service provider other than the original one. This is not limited to but includes, for example, insertion or replacement of advertisements.

### 7.5.2 No graphical overlays

The HDTV IRD shall not allow any graphical overlays on top of the original programme signal by any service provider other than the original one,

regardless of whether the overlays appear on the whole screen or on parts of the screen.

The display of general (neutral) information such as information on the current/following programme and IRD related information displayed as part of the navigator (e.g. menus) is allowed.

### 7.5.3 No concurrent display of programme signals and other content

The HDTV IRD shall not allow the concurrent display of the programme signal and any other content (video, images, text), such as by a split screen mechanism, unless the original service provider issues explicit permission for this or in the case of picture in picture functionality.

The display of general (neutral) information such as information on the current/following programme and IRD related information displayed as part of the navigator (e.g. menus) is allowed.

### 7.5.4 No rescaling of the programme signal

The HDTV IRD shall not allow the rescaling of the programme signal except in non-discriminatory EPGs and/or navigators, or as part of picture in picture functionality.

### 7.5.5 No automatic ad zapping

The HDTV IRD shall not allow automatic ad zapping, for example tuning to another service during advert breaks.

This also applies to the playback of recorded content (see Clause 8.)

## 8 DIGITAL VIDEO RECORDER (DVR)

All clauses herein apply only to HDTV IRDs with internal or external storage capabilities (DVR).

## 8.1 Content security

The recorded content shall be accessible and decodable at any time. The access and decoding of the recorded content shall be in compliance with Clause 7.4.

The DVR shall display information about content security restrictions inside an EPG and in information concerning the current/following programme based on the EIT Schedule and EIT current/following based on the copy-control descriptor as described in Clause 7.4.

All content security restrictions in force at the time of recording shall be observed during playback of the content.

## 8.2      DVR scheduling

If the recording time is scheduled via an EPG, the recording process of the DVR should be triggered via the information concerning the current/following programme (EIT current/following).

## 8.3      Maturity rating

The maturity rating information (see also Clause 7.3) shall be stored together with the recorded content and shall be processed during subsequent playback of the content.

# 9      MIDDLEWARE

In cases where the HDTV IRD is capable of handling interactive applications delivered via DVB-Datacasting (e.g. DVB DSM-CC) or via an IP connection, the middleware should be compliant with ETSI TS 102 796 V1.1.1 [25].

# 10      SYSTEM SOFTWARE UPDATE

The HDTV IRD shall provide a software download mechanism for the download of software modules. The manufacturer is responsible for providing a secure and download mechanism safe from failure.

The system software update mechanism shall comply with state-of-the-art and approved security mechanisms.

The HDTV IRD software download mechanism shall provide a facility for replacing the existing system software with another.

User preferences settings and channel lists shall be preserved. In cases where this cannot be guaranteed, the user shall be explicitly informed that user settings will be affected during the update process.

Update mechanisms required by the CA system vendor shall be supported. The actual download process should be initiated by the user.

The progress of the update procedure shall be displayed on screen.

The update procedure shall be designed in such a way that the user can interrupt the update procedure any time without corrupting the currently installed IRD system software.

Any security aspects regarding system software updates shall be in the responsibility of the HDTV IRD vendor.

The HDTV IRD vendor and/or its representative in the Austrian market shall be fully responsible for all software updates, and guarantees an update if necessary.

The HDTV IRD vendor and/or its representative in the Austrian market will indemnify ORS for all possible claims in regard to downloads to the HDTV IRD.

## 10.1      SSU over-the-air (broadcast download)

The HDTV IRD should be capable of establishing a system software update (SSU) via broadcast download. This may be done in accordance with [13].

In cases where the new system software is broadcast via ORS transponders, the HDTV IRD manufacturer shall provide:

- o   a TS-File for cyclic broadcast; and
- o   the necessary descriptors/parameters that are to be signalled.

## 10.2      Local download

It shall be possible to make downloads using a local data interface. The HDTV IRD manufacturer shall define the protocol mechanisms. The actual download is in the user's responsibility.