HDTV IRD GUIDELINES AUSTRIA

Profile:
Zapping

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1   INTRODUCTION

1.1   Scope

This document outlines a set of minimum requirements for IRD's (integrated receiver decoder) used for receiving the satellite SD (standard definition) and HD (high definition) television programming distributed by ORS for the Austrian market.

This guideline defines only a minimum set of requirements and is not intended to be a complete specification for IRD's.

The Zapping Profile lists the minimum requirements to receive digital audio and/or video and/or data services distributed via satellite in either standard or high definition.

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.

1.3   Terminology

Shall (mandatory):   Denotes that the item is mandatory.
Should (recommended):   Denotes that the item is not mandatory, but highly
                            recommended.

1.4   Definitions

AVC

Advanced Video Coding a standard for video compression. See also H264

CA

Conditional Access System, The mandatory Conditional Access System is CryptoWorks (by Irdeto), starting from fall 2008, Irdeto will be added, For more information refer to www.irdeto.com

CSA

Common Scrambling Algorithm

CAM / CIM or Common Interface Module

Conditional Access Module. Standardized interface between a host device (e.g., a set-top box or DTV) and a removable security module.

DVB

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

EIT

Event Information Table

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).

HD

High Definition Television

HDMI

High Definition Multi-media Interface

IRD

An Integrated Receiver Decoder or an CryptoWorks or Irdeto certified Set Top Box

Mb

Megabit

MPEG

MPEG (pronounced M-peg), which stands for Moving Picture Experts Group, is the name of a family of standards used for coding audio-visual information (e.g., movies, video, music) in a digital compressed format. (www.mpeg.org)

NIT

Network Information Table: Provides information about the physical network TM2451R2

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 service

SCART

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

SD

Standard Definition Television

SDT

Service Description Table; Contains data describing the services in the system e.g. names of services, the service provider, etc.

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 programs.

USB

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

Zapping Profile

IRD's capable of receiving, decoding and displaying video, audio, dolby Audio, teletext and subtitling without the ability to download applications via the broadcasted transport stream.

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. (ETSI).
[3]	ETSI EN 302 307 V1.1.2	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 v1.7.1	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 v1.7.1	Digital Video Broadcasting; Specification for service information (SI) in DVB Systems
[12]	ETSI TR 101 211 v1.7.1	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 within digital broadcasting systems.
[16]	ETSI TS 102 201 v1.2.1	Interfaces for DVB Integrated Receiver and Decoder
[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

2 HARDWARE REQUIREMENTS

2.1 Satellite Tuner and Demodulator

2.1.1 General

The IRD shall include one tuner/demodulator unit for reception of signals from a satellite RF outdoor unit.

The IRD should have an RF-bypass (RF in - RF out).

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

2.1.3 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 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 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).

2.1.4 Input Frequency Range / Tuning Range

The input frequency band to the RF-unit with antenna may cover the frequency range 10.7GHz to 12.75GHz on each of two polarizations. The RF unit may be configured to select and convert any of the four 1 GHz bands (upper or lower half band on 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 2.1.2.

2.1.5   Tuning / Scanning Procedures

2.1.5.1   General

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

The IRD shall either use the NIT information or the scanning procedure for retrieving the services available on the network.

2.1.5.2   Dynamic Channel Management

The IRD should update the modulation parameters according the NIT.

The service list shall be updated with the SDT.

2.1.5.3   Dynamic PMT

The IRD shall be able to handle dynamic changes in the Program Map Table (PMT).

A practical use scenario for dynamic PMT changes is for example the requirement to support switching on and off regional variants of programs by a broadcaster.

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

- o Dynamic changes in the PMT shall not produce any disturbances in the Audio/Video output.
- o In case 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 the elementary streams are scrambled or not.

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

2.1.6   Satellite Tuner Interface and Signal Levels

2.1.6.1   RF Input Connector

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

2.1.6.2   RF Output Connector

The 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 IRD (operational or stand by), so that there is no restriction for the operation of the connected equipment.

2.1.6.3   Signal Level

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

2.1.6.4   Power Supply and Control Signals to RF unit

The IRD shall provide 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 +/- 0.25V

  ▪   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 polarization within each unit.

The IRD should support the DiSEqC 1.0 specification.

2.2   MPEG-2 Demultiplexer

2.2.1   General

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

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

Additional requirements:

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

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

The IRD shall be capable to utilize at least 32 elementary streams simultaneously, which requires 32 PID filters.

The IRD shall provide at least 32 section filters.

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

2.2.2   DVB Descrambler

The descrambler unit shall be based on the Common Scrambling Algorithm (CSA) as specified by DVB, see DVB A 011 [1].

The IRD shall be able to evaluate the CA descriptor regardless if it is inserted in the PMT at program level or program element level.

2.3   Video Decoding

The IRD video decoding subsystem shall comply with ETSI TS 101 154 v1.7.1
[5]. Still pictures shall be supported in all modes listed below.

2.3.1   SDTV

2.3.1.1   MPEG-2

The 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 IRD has to support MPEG-2 Main Profile Main Level bit streams
        (MPEG-2 MP@ML).
o   The IRD shall support the decoding and display of video material with a
        frame rate of 25 Hz interlaced.
o   The IRD shall be able to decode bit-streams with 4:3 and 16:9 aspect
        ratio.
o   The IRD shall support a luminance resolution of 352x576 to 720x576.

2.3.1.2   H.264/AVC

The 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 IRD shall support decoding and displaying of H.264/AVC Main Profile,
        Level 3 bitstreams.
o   The IRD shall support the decoding and display of video material with a
        frame rate of 25 Hz interlaced or progressive.
o   The IRD shall be able to decode bit-streams with 4:3 and 16:9 aspect
        ratio.
o   The IRD shall support a luminance resolution of 352x576 to 720x576.

2.3.1.3   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).

In case a 4:3 aspect ratio is preset in the IRD user preferences settings and
video with an aspect ratio of 16:9 is to be displayed, the IRD shall do an
automatic 16:9 letterbox conversion.

2.3.2   HDTV

The IRD should be fully DVB-S2 HD compliant.

2.3.2.1   H.264/AVC

The 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 IRD shall support decoding and displaying of H.264/AVC High Profile, Level 4 bitstreams.

o   The 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 IRD shall be able to decode bit-streams with 16:9 aspect ratio.

o   The IRD shall support a maximum luminance resolution of 1920x1080.

The following HD video formats shall be mandatory supported:

   o   1280x720p/50
   o   1920x1080i/25

2.4   Audio Decoding

The 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 IRD shall keep the produced audio/video streams in sync to get an 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)

2.4.1   Multichannel Audio

The IRD shall be able to output an audio stream as non-PCM encoded audio to the digital audio interface (see 2.5.2 and 2.5.4.2) if there is a Dolby Digital (AC-3) stream present for the chosen service in the incoming transport stream.

If present, the AC-3 multi-channel audio stream shall be decoded to a stereo down-mix and shall be fed to the analog stereo output connectors (see 2.5.1 and 2.5.4.1)

2.5 IRD Interfaces

2.5.1 SCART Interface

The IRD shall have a TV SCART interface and should have a VCR SCART interface.

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

The On Screen Display should not be present on the VCR SCART output except for the DVB subtitling (if present and chosen).

PIN8 shall be used for signaling of 16:9 formats.

2.5.2 Digital Audio Video Interface (HDMI)

The IRD shall have at least one HDMI output as described in ETSI TS 102 201 [16], sub-clause 4.6. Minimum requirement is the support of HDMI 1.0.

The IRD shall support HDCP digital content protection on all digital media outputs. Minimum requirement is the support of HDCP 1.1.

2.5.2.1 Content Protection Signaling

It should be possible to signal content protection as described below.

Content protection signaling affects the digital HD output (HDMI).

It shall not be possible to deactivate the HDCP function if it is signaled.

The protection status is signaled in the first loop of a content descriptor in the EIT p/f.

```
ContentDescriptor {
ContentLoop {
content_nibble_level_1 4 bit
content_nibble_level_2 4 bit
user_nibble_1 4 bit, used for Content Protection Signaling
user_nibble_2 4 bit, not used
}
}
```

user_nibble_1:

b3	b2	b1	b0	Affected Outputs	Protection Status
x	x	x	0	HDMI	HDCP off

x	x	x	1	HDMI	HDCP on

If an EIT is not available in the current transport stream, but the
EIT_present_following_flag is set to '1' (in the SDT), the current program shall be
handled as if signaled with bitmap 'xxx1' (HDCP on).

If an EIT is not available in the current transport stream, and the
EIT_present_following_flag is set to '0' (in the SDT), the current program shall be
handled as if signaled with bitmap 'xxx0' (HDCP off).

If an EIT is available in the current transport stream, and the EIT does not
contain the content descriptor, the current program shall be handled as if
signaled with bitmap 'x000' (HDCP off).

2.5.3 Component Video (YPbPr)

The IRD shall have analog component video output (YPbPr, RCA connectors).

2.5.4 Audio Interfaces

2.5.4.1 Analog Audio

The IRD shall have an analog audio stereo output (left and right channel RCA
connectors).

2.5.4.2 Digital Audio

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

2.5.5 Data Interface

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

- o RS232C as defined in ETSI TS 102 201 [16], subclause 4.7.1
- o Universal Serial Bus Port, USB 2.0 [17]
- o Ethernet Port: IEEE 802.3, 10/100 MBit/s auto sense with DHCP.

2.5.6 DVB Common Interface

In case the IRD lacks an embedded CA system (currently CryptoWorks or from
Fall 2008 onwards either an embedded Irdeto or CryptoWorks CA System), the
IRD shall be equipped with a DVB Common Interface slot in compliance with the
Common Interface specification ETSI EN 50221 [20].

3   SERVICE INFORMATION

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

The 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 the IRD shall be able to process: PAT, PMT, CAT, NIT, SDT, EIT, TDT, TOT

The 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 IRD:

content_descriptor, short_event_descriptor, extented_event_descriptor

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

The receiver shall support an extended_event_decriptor of up to 1.000 characters per event. Per service a maximum of 200 Events must be handled.

4   NAVIGATOR

The IRD shall implement a Navigator, which allows the user to control the operation of the IRD, and which provides user access to system information (user preferences settings, system settings, initiating 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 program guide which displays information extracted from relevant DVB-SI tables, in particular SDT, EIT present/following and EIT schedule. Short event, extended event and content descriptors shall be processed and displayed.

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

5   TELETEXT AND DVB SUBTITLING

5.1   Teletext

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

The IRD shall be able to display Teletext using the OSD(*).

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].

(*) The remote control shall have a "Teletext" key.

5.2   DVB Subtitling

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

The enabling and disabling of the subtitles shall be user controlled through the user interface.

If both DVB-subtitling and Teletext subtitling are received simultaneously the IRD shall only display the DVB-Subtitling stream.

6   CONDITIONAL ACCESS

The IRD shall support DVB Conditional Access (CA) in one of the following ways:

Embedded CA system

or

Embedded CA system and one ore more DVB Common Interface slot(s) for DVB CAMs

or

One or more DVB Common Interface slot(s) for DVB CAMs

Each CI-slot of the IRD shall be in compliance with the Common Interface specification ETSI EN 50221 [20].

Currently, the CA system in use for Austrian public and commercial TV services is **CryptoWorks**.

Starting fall 2008 it is planned to add the **Irdeto** CA System to the CryptoWorks CA system.

The Irdeto embedded CA system has to be integrated according to the rules of Irdeto and the test procedure and licensing terms as defined by Irdeto have to be observed. This is valid and mandatory also for any subsequent updates of the Irdeto CA system. The vendor has to provide ORS written and certified proof that its IRD fulfills all requirements as stipulated in the Irdeto specification.

7 SYSTEM SOFTWARE UPDATE

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

The IRD software download mechanism shall provide the possibility to replace the existing system software with another.

User preferences settings and service listings shall be preserved. In case that this cannot be guaranteed, the user has to be explicitly informed that user settings will be affected during the update process.

The actual download and update procedure itself always has to be initiated by the user.

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

The update procedure shall be designed in way so 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 the responsibility of the IRD manufacturer.

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

The IRS manufacturer and/or its representative in the Austrian market will imdemnify ORS for all possible claims in regard to downloads to the IRD.

7.1 SSU Over-The-Air (Broadcast Download)

The IRD should be capable of establishing a system software update (SSU) via broadcast download. This can be according to [13].

In case the new system software is broadcasted via ORS transponders, the IRD manufacturer has to provide:

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

7.2   Local Download

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

8   GENERAL REQUIREMENTS

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

The IRD should have a power consumption of less than 1W during standby mode.