IRD GUIDELINES FOR THE DVB-T (S) PLATFORM AUSTRIA

Profile

Enhanced

Released

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Notice

The information contained in this document is subject to change without notification.

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1 INTRODUCTION

1.1 Scope

In December 2003 the Austrian regulatory authority, KommAustria, issued a digitization plan that defines three features as vital for a successful introduction of digital terrestrial TV in Austria.

These three performance features are:

- Program variety (as possible)
- Digital added value (additional services)
- New forms of reception (portable indoor, when economically reasonable)

The existing terrestrial offer of television channels in Austria is very limited. Even when terrestrial broadcasting is digitized, a great variety of television channels like in neighboring countries will not be available in Austria - especially during the introduction phase with two multiplexes. Therefore additional services like enhanced TV or Electronic Program Guides are planned as an integrated feature for DVB-T in Austria, in order to demonstrate the benefits of digital TV towards the consumers.

The two Austrian national broadcasters ORF and ATVplus are well prepared for providing attractive additional information services based on the open European standard MHP to the consumers, right from the start of DVB-T. The quality of these services shows their potential of becoming the follower of the conventional videotext. Also other Austrian broadcasters have already made their experiences with the development of MHP-based information services.

This is why the specification of an Enhanced IRD for the Austrian market is an imminent need to bring existing offers to the Austrian households and to let them experience the added value of digital broadcasting.

This document specifies a set of minimum requirements for IRD's used for DVB-T (S) reception in Austria. The specification covers standalone STB's as well as integrated TV-sets used in the Austrian market.

It provides a technical specification to support either IRD manufactures as well as service providers to implement services and appliances for DVB-T (S) in Austria.

This specification includes requirements for the following profiles:

- The ***Enhanced Profile*** defines requirements to receive digital broadcast with support for enhanced applications. The requirements for this profile are based on the DVB-MHP 1.1.2 Enhanced Broadcast Profile.

This specification defines only a minimum set of requirements and is not intended to be a complete specification for IRD's. Additional features like e.g. Smartcard Readers and Dolby Digital are possible but will not be part of the certification process.

The intention of this specification is that all set-top-boxes with the enhanced and interactive profile are strongly supported from the broadcasters and the KommAustria. This profile allows an interpretation of the offered services. It is also planned that during the switchover period from analog to digital TV the enhanced and interactive profile set-top-boxes are subsidized for consumers from the Austrian regulatory body.

1.2 Document History

Version	Date	Comments
0.1	09.02.2006	This is the first version of the Enhanced Profile Specification
1.0	07.03.2006	Released Version

1.3 Terminology

Shall (mandatory): This word means that the item is mandatory

Should (recommended): This word means that this item is not mandatory, but highly recommended

1.4 Definitions

Interactive Profile (as dfined in IRD Guidelines for the DVB-T (S) Plattform in Austria)

IRD's or iDTV's for this profile enhance the feature set of an audio/video receiver by the ability to download applications via broadcast. Additional, it supports a return channel for use by applications running on the IRD or idTV.

Enhanced Profile

IRD's or iDTV's for this profile enhance the feature set of an audio/video receiver by the ability to download applications via broadcast.

1.5 References

[1]	ETSI TS 101 812 v 1.3.1	Digital Video Broadcasting (DVB) Multimedia Home Platform (MHP) Specification 1.0
[2]	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]	EN 300 744 v1.4.1	DVB Framing structure, channel coding and modulation for digital terrestrial television. (ETSI)
[4]	IEC 60169-2, part 2	IEC 60169-2 Ed. 1.0 b:1965, Radio-frequency connectors. Part 2: Coaxial unmatched connector
[5]	ETR 154	Digital broadcasting systems for television; Implementation guidelines for the use of MPEG-2 systems; Video and audio in satellite and cable broadcasting applications
[6]	ISO 13818-1	Information technology - Generic coding of moving pictures and associated audio information: Systems.
[7]	ISO 639.2	Code for the representation of names of languages
[8]	ITU-T V.92	Enhancements to Recommendation V.90
[9]	EN 50049-1	Domestic and similar electronic equipment interconnection requirements: Peritelevision connector
[10]	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]	EN 300 468	Digital Broadcasting Systems for television, sound and data services; Specification for service information (SI) in Digital Video Broadcasting (DVB) Systems
[12]	ETR 211	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]	ETS 300 231	Television systems; Specification of the domestic video Programme Delivery Control system (PDC)
[15]	ETSI ES 202 130 V1.1.1	Human Factors (HF);User Interfaces; Character repertoires, ordering rules and assignments to the 12-key telephone keypad
[16]	ETSI EN 300 472	Conveying ITU-R System B Teletext in DVB bitstreams

[17]	ETSI EN 301 775	Conveying VBI data bitstreams

2 HARDWARE REQUIREMENTS

2.1 Terrestrial Tuner Demodulator

2.1.1 General

The IRD shall include one tuner/demodulator for reception of signals from terrestrial transmitters, broadcasting in accordance with [3]

The transmission uses single frequency networks (SFN) or multi frequency networks (MFN).

2.1.2 RF

The IRD shall be able to receive all channels in the UHF band (Band IV-V with bandwidth 8 MHz) and the VHF band (Band III with bandwidth 7 MHz).

The IRD shall be able to work with any combination of the following constellations

Transmission mode	2k or 8k COFDM
Modulation	QPSK, 16 QAM, 64QAM, hierarchical 16-QAM, hierarchical 64 QAM
Code rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32
Hierarchical Modulation	Not applicable

The behavior in the presence of Echoes shall be according to EN 300 744. The maximum allowed signal level must be greater than -28 dBm (80 dBmV on 75 Ohm) without degrading of the signal.

The hierarchical modulation will be not used in the Austrian DVB-T network. Since it is part of the DVB-T specification it is recommended to integrate the standard.

The receiver shall provide at least a basic status check function (within the set-top-box menu) that presents reception quality information for a selected service (eg signal strength, reception quality and channel id).The implementation of the user interface is within the responsibility of the manufacturer.

The RF input shall support DC power to an external antenna with amplifier. The DC power shall be protected against short circuit and there shall be an alternative in the menu system to turn the DC power supply on and off (default factory setting shall be off).

2.1.2.1 RF Input Connector

In accordance with [4] the IRD shall have one input tuner connector, type: IEC 169-2 female. The input impedance shall be 75 ohm.

RF Output Connector (pass through), IEC 60169 Male. (not applicable for idTV)

2.2 Tuning/Scanning

The IRD shall provide a scanning procedure over the whole frequency range. If the same Transportstream Id and Service Id can be received from two or more frequencies the receiver shall either store both frequencies or select the stronger signal.

It shall also be able to receive and react on tuning parameters in PSI/SI (e.g. SDT or NIT).

2.2.1 Dynamic Channel Management

The IRD should update the modulation parameters according the NIT. The service list shall be updated with the SDT.

2.2.2 Dynamic PMT

For regional content the IRD shall have support for dynamic switching according the information in the PMT.

For display / indication of different components which change dynamically as e.g.:

- Switching-on and off of regional variants of programs by the broadcaster

The IRD should evaluate dynamically changing PMT's correctly and in real time.

Dynamic changes in the PMT shall not produce artifacts in Audio/Video output.

2.3 Interfaces & Signal Levels

2.3.1 SCART Interface

The IRD shall have a SCART interface in accordance with [9], [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. Not applicable for idTV's or USB-Sticks.

2.4 Processor

The receiver shall have a real time clock which is updated by incoming TDT and TOT from SI.

An internal timer shall provide automatically switching from stand by to operation mode.

2.4.1 Enhanced Profile

The socket of the CPU should be a PGA type. It is recommended that the processing power of the included Processor has a minimum of 250MIPS.

2.5 Memory

2.5.1 Enhanced Profile

The minimum memory configuration for the Enhanced Profile shall be:

- 48 MB RAM
- 10 MB Flash memory

The recommended values are 64 MB RAM and 16 MB Flash. 2 MByte of the flash memory shall be dedicated to and shared by the broadcasters (persistant non-volatile memory).

A minimum of 24 MByte of the SDRAM has to be dedicated to loaded MHP Applications.

2.6 MPEG-2 Demultiplexer

The Demultiplexer shall be compliant to the MPEG-2 transport layer defined in [6].

- Shall utilize the MPEG2 Service information as specified in Part B
- Shall be able to decode an ISO/IEC 13818-1 stream with data rates up to 58 MBit/s
- Shall be capable to utilize at least 32 elementary streams simultaneously, which requires 32 PID filters
- Shall support variable bit rate elementary streams within a constant bitrate transport stream

The IRD shall support [5].

2.7 MPEG Decoder

The video decoder shall fully comply with the DVB Implementation guidelines for the use of MPEG -2 systems and ETR 154. The Video Decoder shall support MPEG-2 Main Profile@Main Level and fully comply with [5] (sub clause 5.1; 25 Hz Standard TV).

The video decoder shall be able to decode at bitrates down to 600 kBit/s for video resolutions up to full resolution 720x576.

For multilingual support the de-multiplexing shall support a user interface to select different PID's for different audio streams.

It shall be able to switch between aspect ratio of 4:3 and 16:9.

In case of receiving an anamorphot video and a preset aspect ratio of 4:3 on the IRD, the decoder shall do a 16:9 letterbox conversion.

The Audio Decoder shall support MPEG-1 Audio Layer I and II.

The decoder shall keep the produced audio/video streams in sync to get an adequate lip-synchronization (ETR 154).

2.7.1 Requirements for DVB Set-Top-Boxes regarding Multichannel Audio

This document describes some basic requirements for successful DVB-Multichannel Audio operation along with some common problems found in recent STB´s. The following standards and recommendations serve as the reference documents.

ISO/IEC 11172 -3	Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s – Part 3: Audio
ISO/IEC 13818 -1	Generic coding of moving pictures and associated audio information – Part 1: System
ETSI TS 300268	Spezification of service information (SI) in DVB systems
ETSI TR 101 154	Implemetation guidelines for the use of MPEG-2 systems

In order to successfully receive and also forward multichannel audio streams from TV and Radio channels within DVB streams, and to satisfy consumers needs, the following requirements should be met:

Basic operation of the STB (switching between channels) should be possible without a TV screen. This can be done with a Radio/TV button on the front plate or on the remote control (not applicable for idTV).

In case of an alphanumeric display (optional) the STB should be large enough to accommodate the full length of the station name (up to 12 characters).

Software:

If a DVB stream is labeled as a „Radio Service", it should always be shown in the radio channel list, even if there might be an elementary video stream sent along.

Changes in the audio descriptors as well as in the PMT should be dynamically recognized in real time. This should allow proper recording of ac-3 streams even if they are not present at the time of the timer programming.

2.8 Graphics Processing

The IRD shall support resolutions of 720 x 576 pixels and lower.

It shall support at least one CLUT with a minimum of 16bit color palette, including 5 levels of transparency.

The actual presentation shall be specified as defined in [1].

The user shall be able to switch off the automatic visualization of the startup processes of iTV-applications (e.g. startup bar, initialization-information).

The IRD shall support Font rendering with anti-aliasing.

The IRD shall support alpha blending with images.

2.9 Video Processing

The IRD shall support dynamic video scaling from 0,15 to 3,0.

It shall support free positioning of video on screen.

It shall be possible to switch between scaled video and full screen and vice versa.

The IRD shall support MPEG-2 Video drips according to [1].

2.10 MHP-PVR (optional)

A PVR capable IRD shall support programming by EIT and PDC [14].

The PVR shall store all content belonging to a service, including MHP- applications/content.

3 BOOTLOADER

3.1 Introduction

The IRD shall provide a software download mechanism for download of software modules. The modules may build a complete system or consist only of parts of it, e.g. drivers, upgrades. It shall be possible to replace all parts of the system. The manufacturer is responsible of providing a secure and failure safe mechanism for download.

User settings like service listings and resident applications shall be preserved, except the user is asked that these settings will be deleted.

In case of available software upgrade the IRD shall inform the user and the actual upgrade shall be initiated by the user. The receiver has to look automatically, on all available transponders for available software upgrades.

A manual and an automatic download should be supported from the user menu. The automatic support shall be an option in a user menu. An automatic download should be started app. 30 minutes after switching the receiver in the standby mode. If a timeout occurs, a new download should be started app. 60 minutes later. Further the user shall have the possibility to select the channel where the search for he download should start (for automatic and manual mode). For all the procedures – download/storage/Write to Flash – an on screen display has to guide the user. The user has to be fully guided via on screen display and a progress bar shall give the information about the status of the process. For the download a timeout mechanism is required.

Download shall be done automatically but only be installed after explicit confirmation by the user. If the user does not want to install the software it will be deleted from Flash.

3.2 Upgrade Over-The-Air

The IRD shall be capable of establishing a software upgrade via broadcast download. This can be according to [13].

The set-top-box supplier has to supply a trp-File to the multiplex operator which includes the software. The multiplex operator will specify the PID and together with the supplier the required Descriptors in the PMT.

4 MIDDLEWARE & API

4.1 Introduction

As long as there isn't a valid PKI (Private Key Infrastructure) established for signing MHP applications used in Austria IRDs shall treat unsigned applications as if they are signed applications. The IRD shall be able to change this behavior by upgrading the middleware.

4.1.1 Enhanced

The IRD shall have system software for interpretation and handling of the active service information and control of the local hardware/software.

It is recommended to integrate a virtual keyboard in the receiver software.

MHP-Profile

The Enhanced IRD shall support at least all the mandatory features specified for DVB-MHP Enhanced Broadcast Profile, as defined in [1]. As minimum requirement the MHP 1.1.2 specification will be used.

As defined in [1] B 5.2 the IRD shall use transparent caching as default caching strategy if there exists no Caching priority descriptor.

A SDRAM Memory Management shall be applied where the latest started application has the priority. A loaded, auto-start application shall not be automatically purged from SDRAM.

Interaction Proprietary and Broadcast Application

Proprietary Set-top-Box applications and MHP Applications shall not interrupt each other. If an auto-start application is signaled, all the standard TV functions shall be accessible and their use shall not cause an interruption to the MHP application downloading (except menu key).

If the menu key on remote control is pressed, any running, paused or loading MHP application has to be killed. After closing the GUI an auto-start application has to be restarted automatically.

When a resident application is called by the user or automatically started this shall not kill active loaded MHP Applications. The MHP application can either be paused and restarted or cached and than reinitiated after the proprietary receiver menu is closed.

4.2 Font

The IRD shall have one resident font. This is:

- Tiresias as defined in [1]

4.3 Service Information

The IRD shall be able to process the incoming SI data (descriptors, tables) according [11] and [12].
The IRD shall be able to process the PSI/SI tables for both, the ‘Actual’ and the ‘Other’ transport stream.

The following tables are a mandatory set of tables the IRD shall be able to process:

NIT, CAT, PAT, PMT, SDT, EIT, TDT, TOT

The IRD shall process the following EIT tables:

- EIT actual (present/following/scheduled)
- 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

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

In addition, the IRD shall be able to make the processed data available through the DVB-MHP API [1]. As minimum the profile MHP 1.1.2 shall be supported.

The IRD shall support all DVB-SI additions as defined in the DVB-MHP specification [1].

4.4 Navigator

The IRD shall be able to read and use language descriptors [7] associated with the audio-streams in the MPEG-2 transport stream [6].

The user shall be able to set storable preferences for 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.

The IRD shall provide a basic EPG for the display of EIT Present/Following (short event descriptor, extended event descriptor, content descriptor). Also the EIT Scheduling table should be presented within the proprietary receiver navigator.

4.5 Teletext and Subtitling

The IRD shall be able to display Teletext by insertion of the teletext data in the VBI of the analogue CVBS video output. Insertion shall conform to ITU-R BT.653-2.

For professional IRD's the VBI-signal which is transported on a different PID has to be inserted in the CVBS video output as well. For VBI and Teletext the actual DVB standard has to be applied [15, 16].

For digital subtitling the ETSI DVB specification 101 812 on subtitling in digital services shall be used. However compatibility must also be remained with subtitling through teletext. The implementation of digital subtitling is mandadory.

4.6 User Preferences

The user shall be able to store user preferences.

The IRD shall provide API's according [1] to access the stored User Preferences.

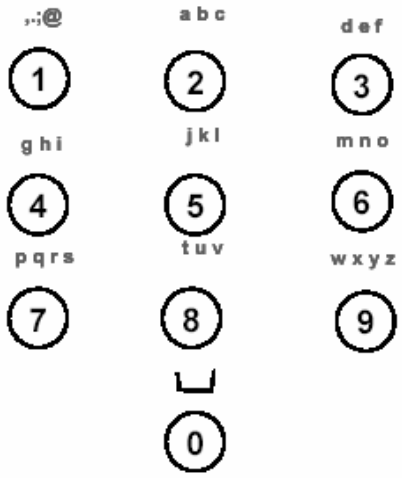
5 REMOTE CONTROL

The IRD shall have a remote control. The minimum required keys are depending on the profile.

The Remote Control shall have SMS labeled buttons and support virtual keyboards as defined in [1] J.5[1][1].

The remote control for Enhanced Profile shall have at least the following keys:

- Include 10 digit keys, labeled 0-9.
- Program up/down – function to switch between programs.
- Volume up/down – function to adjust the volume output level.
- Up, down, left, right – for navigation on the OSD
- Ok
- Multifunctional keys (red, green yellow, blue)
- TV/Radio key
- SMS shortcuts as defined in [15]



- Info, Exit, Back, Txt, EPG, Menu
  It shall be possible to program the buttons mentioned above from the mhp application (e.g. TXT Button for start of an Infotext application).

Table 1 Remote Control key codes

Key	**Key code**
Exit	VK_ESC
Back	VK_F9
Txt	MHP standard

ANNEX I - SATELLITE

The here specified parameters are used only for the Satellite Receivers and are applicable instead of the parameters mentioned in the document before (RF and Smart card reader). All other specifications should be applied to the satellite receivers as well.

Satellite Tuner Demodulator

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- out (pass through).

RF

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 incoming digital DVB signals will comply with EN 300 421 [2]. The IRD shall accept symbol rates on the incoming carrier in the range 10 Mbaud to 30 Mbaud.

The input frequency band to the RF-unit with antenna may cover the frequency range 10.7 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.

Common Interface (optional)

If the IRD has a Common Interface the middleware shall support the non-CA and the CA smart card API as defined in [1].

DVB-S IRD’s shall support Cryptoworks, either embedded or by using a CICAM.