Unified Requirements of HDTV DVB-C and DVB-T2 digital receiver for Finnish market

Version 2.0

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1 Introduction

1.1 General

This document describes the functional and technical requirements for digital DVB-T2 and DVB-C receivers for the Finnish Digital Terrestrial and Cable Television market.

1.2 Version History

Version	Date	Comments
V. 1.0	10.10.2010	Release Ver. 1.0
V. 2.0	13.12.2011	Annual update

1.3 References

[1] NorDig Unified Requirements for Integrated Receiver Decoders for use in cable, satellite, terrestrial and IP-based networks, version 2.2.1, 1st of July, 2010.

[2] Security requirements of digital HDTV receiver for the Finnish market, Version 2.0. 13th of December, 2011.

[3] Digital Video Broadcasting (DVB); Specification for System Software Update in DVB Systems, ETSI TS 102 006, V1.3.2 (2008-07).

[4] "CI Plus Specification. Content Security Extensions to the Common Interface." version 1.2 or later.

[5] Digital Video Broadcasting (DVB): Digital broadcasting systems for television, sound and data services: Specification for Service Information (SI) in Digital Video Broadcasting (DVB) systems, ETSI EN 300 468, V1.11.1

[6] Digital Broadcasting Systems for Television, Sound and Data Services; Guidelines on the Implementation and Usage of DVB Service Information, ETSI TR 101 211 V1.9.1.

1.4 Abbreviations and definitions

Shall Requirement which is mandatory to implement

Should Requirement which is not mandatory to implement but strongly recommended

AC-3	Audio Codec-3 (Dolby Digital)
AVC	Advanced Video Codec
BER	Bit Error Ratio
CI	Common Interface
CI+	Common Interface Plus
C/N	Carrier to Noise Ratio
DTT	Digital Terrestrial TV
DVB	The Digital Video Broadcasting Project
DVB-C	DVB standard for Digital Cable Transmission
DVB-S	DVB standard for Digital Satellite Transmission
DVB-S2	DVB standard for Digital Satellite Transmission – 2nd generation

DVB-T	DVB standard for Digital Terrestrial Transmission
DVB-T2	DVB standard for Digital Terrestrial Transmission – 2nd generation
HDCP	High-Bandwidth Digital Content Protection
HDMI	High-Definition Multimedia Interface
HDTV	High Definition Television
HE-AACL2	High-Efficiency Advanced Audio Coding Level 2
HE-AACL4	High-Efficiency Advanced Audio Coding Level 4
HOH	Hard-Of-Hearing
EDID	Extended Display Identification Data
EIT	Event Information Table
EPG	Electronic Program Guide
E-AC3	Enhanced AC-3
GUI	Graphical User Interface
IDTV	Integrated Digital TV-set
IRD	Integrated Receiver Decoder
LCN	Logical Channel Number
MMI	Man-Machine Interface
MPEG1-L2	Moving Pictures Experts Group standard 1 - Audio Layer II
MPEG-2HD	Moving Pictures Experts Group standard 2 – High-Definition
NID	Network ID
NIT	Network Information Table
ONID	Original Network ID
OSD	On-Screen Display
OTA	Over-The-Air
PAL	Phase Alternating Line
PCM	Pulse Code Modulation
PSI	Program Specific Information
PVR	Personal Video Recorder
RCA	Radio Corporation of America
RCU	Remote Control Unit
RF	Radio Frequency
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs
SDT	Service Description Table
SDTV	Standard Definition Television
SFN	Single Frequency Network
SI	Service Information
SID	Service ID
SQI	Signal Quality Indicator
SSI	Signal Strength Indicator
SSU	System Software Update
STB	Set-Top-Box
TDT	Time/Date Table
TOT	Time Offset Table
TS	Transport Stream
TSID	Transport Stream ID
UHF	Ultra High Frequency
VHF	Very High Frequency

2 Scope

All functional and technical requirements for the DVB-C and DVB-T2 receivers in the Finnish Digital television networks are described in this document. This document is based on the NorDig Unified Specification [1].

In order to be validated and approved, the IRD shall be compliant with the NorDig Unified Specification and its NorDig Basic@M4 profile. Validated IRD shall also be compliant requirements set in this specification.

In case when IRD supports multiple transmission media, IRD shall be validated as specified below:

1) IRD contains DVB-C tuner, it shall be validated for Finnish Cable Ready HD requirements.
2) IRD contains DVB-T/T2 tuner, it shall be validated for Finnish Antenna Ready HD requirements.
3) IRD contains DVB-S/S2 tuner, it shall be verified with NorDig Unified Specification.

3 General requirements

This documentation provides functional and technical requirements and clarifications for DVB-C and DVB-T/T2 receivers for Finnish digital television environment. When it is not otherwise specified, the following standards apply:

- NorDig Unified Specification [1], Basic@M4 profile
- Security requirements of digital HDTV receiver for the Finnish market [2]

4 Finnish Digital Television Networks

4.1 Terrestrial Networks

Finnish Digital Terrestrial Network consists of five different networks. The networks are:

- DNA DVB-T2 network
- Digita DVB-T and DVB-T2 networks
- Anvia DVB-T and DVB-T2 networks

Also in some parts of Finland it is possible to receive Swedish Digital Terrestrial Network, Norwegian Digital Terrestrial Network or Estonian Digital Terrestrial Network.

All Finnish Digital Terrestrial Networks share the same Original Network ID (0x20F6). Each service can be uniquely defined by the DVB triplet (ONID, TSID and SID). NorDig Unified specification [1] best service selection shall be applied, since Digita DTT network services can be received from multiple frequencies depending of the region. For the networks NorDig Unified specification [1] SFN rules shall also be applied.

DVB-SI information may not be cross-distributed between the networks, but it is cross-distributed within each network. All networks utilize NorDig LCN numbering and this numbering should not conflict between the networks.

Encrypted services in Finnish DTT networks are scrambled using the Conax CA system.

4.2 Cable Networks

In the year 2010, the number of connected households in Finland amounted about 1,5 million households, which represents about 57% of the Finnish households. The biggest cable television operators are DNA/Welho, Elisa, TeliaSonera, Super Head-End Finland (SHEF) and Anvia. These operators also act as super-head-end operators for digital television services.

Cable operators collect their signals from the Finnish digital terrestrial networks and digital satellite transmissions from available satellites. Some additional locally distributed and generated signals are also transmitted. Cable TV operators may also exchange signals between each other.

The free-TV signals on the Finnish digital terrestrial network are mostly publicly available all around the Cable networks. Other services are usually offered as a part of pay-TV packages. Encrypted services in Finnish Cable networks are scrambled using the Conax CA system.

5 IRD requirements

5.1 Minimum IRD interface and hardware requirements

Minimum IRD interface and hardware requirements are:

- All IRDs shall contain at least one RF input as specified by NorDig Unified specification [1].
- RF interface for DVB-T/T2 shall support at least frequency range VHF III on 7 MHz raster and bandwidth and UHF IV – V on 8 MHz raster and bandwidth. Center frequencies for these frequency bands are defined by NorDig Unified specification [1].
- RF connector for DVB-T/T2 shall provide for STBs and should provide for IDTVs 5V, 50mA antenna power supply and if provided, it shall be short-circuit protected. The default setting for antenna power shall be disabled.
- RF interface for DVB-C shall support at least frequency range 110 - 862 MHz, with centre frequencies in the band 114-858 MHz and with an accuracy of +/- 30 kHz on 7 MHz and 8 MHz raster.
- STBs shall have at least one HDMI output interface. This HDMI output interface shall be protected with HDCP. HDMI interface and copy protection are specified in NorDig Unified specification [1] and Security requirements of digital HDTV receiver for the Finnish market [2].
- Any analogue video output, including component video, shall only provide video with SD resolution and frame rate equal with standard PAL signal, regardless of the source video. The support of analogue output interface is optional.
- IRDs shall have either embedded Conax CAS7 system or one CI+ Interface [4] slot or both. If IRD has a CI+ interface it has to be CI+ certified.
- If IRD is equipped with an embedded Conax implementation, it shall be a Conax CAS7 CA system with support of Chipset Pairing. The support for Conax messaging and link protection is optional. The IRDs shall have successfully passed the Conax Conformity Test and Security Evaluation. More information about Conax smart card interface can be found from Security requirements of digital HDTV receiver for the Finnish market [2].
- All IRDs should contain one optical and/or coaxial S/PDIF digital audio out interface according to IEC 60958 or one HDMI audio out interface.
- All IRDs should have stereo audio analog output interface, type RCA.

- The Remote Control Unit shall at least include basic TV functions as specified in the NorDig Unified specification.

5.2 DVB-T 2 Tuner and Demodulator requirements

The DVB-T2 IRD shall comply with the tuner and demodulator requirements as specified in the NorDig Unified specification [1]. (1)

Note 1: The support of TFS and 1.7 MHz raster are optional. If the IRD implements TFS and/or 1.7 MHz raster, it shall be implemented as specified in the NorDig specifications [1].

Note 2: As of today, the Finnish operators are not considering to use TFS before end of 2016.

5.3 DVB-C Tuner and demodulator requirements

The DVB-C IRD shall comply with the tuner and demodulator requirements as specified in the NorDig Unified specification [1].

5.4 Video requirements

The IRD shall comply with the video requirements for HDTV IRDs as specified in the NorDig Unified specification [1].

The automatic setting for IRDs HDMI shall be set to best resolution possible by EDID negotiation. If EDID negotiation fails, then HDMI output shall be set to 1080i with aspect ratio 16:9. STBs shall support original format mode as defined by NorDig Unified specification [1].

If IRD is equipped with analogue video outputs, i.e. SCART interface:

- In case of STB, analogue output must apply the rules specified by the NorDig Unified specification [1]. Teletext subtitling and DVB subtitling shall be available at all analogue video outputs.
- In case of iDTV, the aspect ratio signaling and subtitling is optional in SCART interface.

For STBs Default TV output aspect ratio on analogue outputs shall be set to 16:9. For IDTVs it shall be able to select whether 4:3 aspect ratio video is displayed original size or stretched to 16:9.

5.5 Audio requirements

5.5.1 General requirements

The IRD shall comply with the audio requirements for HDTV IRDs specified by the NorDig Unified specification [1]. The IRD shall support both System A and System B as specified by the NorDig Unified specification [1]; transcoding of E-AC3 and HE-AAC to AC-3 or DTS is mandatory.

IRD shall have at least two audio mode preferences available in the menu. The values can be for example ‘PCM’ and ‘Multichannel’. The audio priorities are defined in NorDig Unified specification [1]. Clarification for NorDig Unified specification in case when there are MPEG1-L2 audio and multichannel audio available for the same language simultaneously is in the table 5.1 below (Audio Track selected and which format is available in different outputs):

	IRD on PCM mode				IRD on multichannel mode (1)			
Audio tracks available	Track selected	S/PDIF out	HDMI out	Analog out	Track selected	S/PDIF out	HDMI out	Analog out
AC3&MPEG1-L2	MPEG1-L2	PCM	PCM	Available	AC3	AC3	depends EDID	Available
MPEG1-L2	MPEG1-L2	PCM	PCM	Available	MPEG1-L2	PCM	PCM	Available
AC3	AC3	PCM	PCM	Available	AC3	AC3	depends EDID	Available
E-AC3&MPEG1-L2	MPEG1-L2	PCM	PCM	Available	E-AC3	AC3	depends EDID	Available
E-AC3	E-AC3	PCM	PCM	Available	E-AC3	AC3	depends EDID	Available
HE-AACL2&MPEG1-L2	HE-AACL2	PCM	PCM	Available	HE-AACL2	PCM	depends EDID	Available
HE-AACL2	HE-AACL2	PCM	PCM	Available	HE-AACL2	PCM	depends EDID	Available
HE-AACL4&MPEG1-L2	MPEG1-L2	PCM	PCM	Available	HE-AACL4	AC3 or DTS	depends EDID	Available
HE-AACL4&HE-AACL2	HE-AACL2	PCM	PCM	Available	HE-AACL4	AC3 or DTS	depends EDID	Available
HE-AACL4	HE-AACL4	PCM	PCM	Available	HE-AACL4	AC3 or DTS	depends EDID	Available
Note 1: IDTVs may select by default multichannel mode if the internal speakers are used for audio. In case of the external interface the audio priorities shall be according the table and NorDig Unified specification.								

Table 5.1 Audio output and selection

5.5.2 Hearing impaired and visual impaired commentary audio

The Finnish broadcasters provide broadcast-mixed audio track for visually and hearing impaired people. These audio tracks are defined with audio type 0x03 (Visual impaired commentary) or type 0x02 (Hearing impaired audio) in the PMT table and may be with or without supplementary audio descriptor. These audio tracks contain broadcast-mixed sound from original audio track and hearing aids. In order to support automatic selection for this audio track, all IRDs shall have user preference available for normal audio / visual impaired commentary audio setting. The switch for selecting normal audio / visual impaired commentary audio also changes audio priorities defined in NorDig Unified specification [1]. The highest priority audio selection is changed from language to audio type. As an example of switch usage and selection:

			Audio selection when switch in normal audio	Audio selection when switch in visually or hearing impaired audio
Audio tracks available	PRI language selection	SEC language selection	Track selected	Track selected
FIN (0x00), FIN (0x03 or 0x02)	FIN	SWE	FIN (0x00)	FIN (0x03 or 0x02)
ENG (0x00), FIN (0x03 or 0x02)	FIN	SWE	ENG (0x00)	FIN (0x03 or 0x02)
GER (0x00), DUT (0x03 or 0x02)	FIN	SWE	GER (0x00)	DUT (0x03 or 0x02)
FIN (0x00), DUT (0x03 or 0x02)	FIN	SWE	FIN (0x00)	DUT (0x03 or 0x02)

Table 5.2 Normal audio / visual impaired commentary audio selection switch

The IRD shall also support supplementary_audio_descriptor as specified in ETSI EN 300 468 [5] and ETSI TR 101 211 [6].

6 IRD Installation

6.1 IRD Installation – General requirements

Initial IRD installation shall be guided installation for the user. IRD installation should follow order:

1. Country selection dialogue. This country selection can be then utilized by IRD when constructing channel lists.
2. Language selection dialogue. Since Finland is bi-lingual country, end-user may prefer Finnish or Swedish user interface. Based on the language selection, Primary audio language and primary subtitling language shall be set by this user selection. Secondary audio language and secondary subtitling language should be set to the other national language. User interface language also defines initial teletext page selection, if available in service PMT table.
3. In case of hybrid tuner IRD, next step is selecting the proper signal input. Possible selections are for example:
    - Terrestrial
    - Cable
    - Satellite
    - IP
    - All/Some
4. Auto/manual scanning dialogue. When user selects auto scan, scanning procedure is defined in paragraphs 6.2.1 and 6.3.1. In case user selects manual scan, scanning procedure is defined in paragraph 6.2.2 and 6.3.2.

If IRD vendor decides to add more user preference selections for user before step 4. This is allowed, but these four selections shall at least be available, three if the IRD is only equipped with one tuner. IRD should not include analogue channel search in the auto-scan.

6.1.1 Multiple LCN numbers

The IRD shall (1) support multiple LCN numbers in both terrestrial and cable networks. The operators may send the same ONID, SID and TSID for the same service with different LCN number, up to 8 individual LCN number, and the IRD shall install the services as many times as they are signaled in the NIT table.

Note 1: The support of multiple LCNs is optional for cable IRDs before January 2013.

6.2 DVB-T/T2 requirements

6.2.1 Automatic scan

Since Finland has five different terrestrial networks and the networks may not have cross-distribution of DVB-SI between the networks, the whole frequency band shall be scanned. The scanning shall begin from VHF III band with 7 MHz raster and bandwidth and shall continue with scanning UHF IV – V bands with 8 MHz raster and bandwidth. The channel list shall be constructed according to chapter 7 of this document. If the IRD has a menu item automatic scan available, when selecting this function, service list database shall be emptied before new automatic scan is performed. When automatic scan is used, automatic service list updates shall be set to ‘enabled’, which means that all SI changes shall be detected. After auto scan is completed, the TV channel with lowest LCN value shall be displayed.

6.2.2 Manual scan

In addition to the automatic search, it shall be possible to perform a manual search where the channel id (or frequency) is entered by the end user. Code rate, constellation and guard interval shall be detected automatically. By manual scan user shall be able to add or replace services user wants to the channel list.

When manual scan is used, automatic service list updates and best service selection shall be set to 'disabled', which means that no SI changes shall be detected. In case IRD has a menu item manual scan available, existing service list shall not be deleted at any time manual scan is launched.

6.2.3 Service list and LCN requirements

Service lists shall be built based on the priority for LCN numbers for services which have ONID Finland (0x20F6). In case when foreign networks can be received, they shall be placed at the end of list using LCN 'last in the list principle'. However in case of IDTV where there is only one channel list available, the order shall be:

1. TV services according to LCN with ONID Finland
2. TV services without ONID Finland
3. Radio services with ONID Finland
4. Radio services without ONID Finland

The Finnish DVB-T2 networks' channel list name should not be visible, because Finnish DVB-T2 network have several independent networks and selection of the channel list name is obsolete.

6.3 DVB-C requirements

6.3.1 Automatic scan

The channel search shall be implemented as specified in the NorDig Unified specification [1] with following scanning parameters:

- Carrier frequencies: 114MHz + n x 8MHz, where n is an integer in the range 0 to 93
- Modulation mode: 16 QAM, 64QAM, 128QAM and 256QAM, where 64QAM, 128QAM and 256QAM should be attempted first.
- Symbol rate: 6.952 MSymbols/s (first attempt). If this rate does not result in reception, the following rates shall be attempted in this order: 6.875, 6.900, 6.950, 6.125 and 6.000 Msymbols/s.

When IRD locks to the first transmitting multiplex, the IRD shall read the NIT actual table and install the network and channels accordingly. The IRD should not scan the other remaining frequencies in the network.

6.3.2 Manual scan

In addition to the automatic search, it shall be possible to perform a manual search where the scanning parameters are entered by the end user. By manual scan user shall be able to add only services user wants to the channel list. When manual scan is used, automatic service list updates shall be set to 'disabled', which means that no SI changes shall be detected. In case IRD has a menu item manual scan available, existing service list shall not be deleted at any time manual scan is launched.

7 General Service list requirements

Service list shall consist of at least two separate lists. One list for TV services and one list for Radio services. In case of IDTV there can be only one service list, where TV services are using LCN numbers defined by NIT for TV services and Radio services using LCN numbers with 'last in the list' principle.

IRD shall support service types as specified in the NorDig Unified specification [1] and additionally support TV service type 0x11, MPEG2-HD service as specified by DVB.

7.1 Default service list

Default service list displayed for the user after auto-scan shall display all TV and Radio channels found during scanning. The order of channels shall be as defined in chapter 6. Default service list shall be considered as a 'master service list' and shall not be user editable.

7.2 User defined service lists

User defined service lists or 'favorite channel lists' are lists where user can sort and select services according to their own preferences. In case when user defined service lists are supported by IRD, these service lists must also be automatically updated during automatic channel list updates, i.e. Service name change, SID change or service removal. The channel numbering in favorite lists can be freely selected.

7.3 Deletion of service lists

Default service list shall be able to be removed by at least one of the following three different ways:

1. Initiating a new automatic scan from the menu.
2. With menu item labeled 'Delete service list' or a similar label.
3. When factory reset is performed.

8 Automatic channel list updates

Channel list updates are triggered by the changes in NIT and/or SDT actual tables. Changes in the SI signaling can be detected by a table version number change. Since there are several networks available, the IRD shall be able to store version number information about SI tables by network basis. When NIT version change is detected from any Finnish network available, all other receivable networks shall also be scanned for network changes as specified in chapters 6.2 and 6.3.

It is recommended that channel list updates are done quasi-statically when the IRD enters to stand-by. If channel list updates are done dynamically,

- If NIT and/or SDT version is changed, it shall be initially verified that service list and/or LCN numbering considering radio and/or TV services is changed in NIT table before channel list update is launched. Any data service updates shall not initiate dynamic channel list update.
- In case of twin tuner IRD, the unused tuner should be used for re-scanning the frequency range if necessary.

9 Signal level meter and Network information display

The IRD shall be able to display reception quality information for a selected frequency as specified by NorDig Unified specification [1]. Accordingly, IRD shall also have a menu item, which displays following information about service currently viewed by the user:

- Channel ID or Centre frequency
- Signal Strength Indicator, SSI
- Signal Quality Indicator, SQI

The integration time for the BER and uncorrected packets calculations shall be a period of 1 second. This signal information display shall be updated regularly (e.g. every second).

10 System Software Update (SSU)

The IRD shall support DVB Specification ETSI TS 102 006 [3] for SSU both simple and enhanced profiles. The support of the enhanced profile as specified in the NorDig Unified specification [1].

There shall be two methods for user to download SSU from the network, automatic download and manual download.

The IRD with CI+ Interface shall support the download of the new CA system software to a CA Module via DVB SSU.

10.1 Automatic SSU download

Automatic SSU download mechanism shall be a menu item available and it shall be enabled by default.

When SSU is discovered from the network by automatic SSU mechanism, and if simple profile is used, the IRD shall display a MMI for user at least each time the IRD wakes up from stand-by to inform that new software is available as long as the SSU is signaled in the network. PVR IRD shall not react to SSU during active recording. If user accepts the SSU download, the NIT linkage for SSU is followed to multiplex having the actual data; software is downloaded and flashed to the memory. When enhanced profile is used, IRD shall have a mechanism to download the new software into memory if IRD is on stand-by when SSU is transmitted and when powered on, display a MMI for user that new software is downloaded and whether it should be activated (flashed). In case when enhanced profile is used, new software is currently available but it is not downloaded to memory and user powers on the IRD, there shall be a similar MMI message available about SSU as with simple profile.

11 Teletext and Subtitling requirements

The IRD shall comply with teletext and subtitling as specified by the NorDig Unified specification [1]. As a clarification to the NorDig Unified specification, IRD:

- Shall not automatically display subtitling in case subtitling language available does not match primary or secondary subtitling language selection.
- Shall not automatically display Hard of Hearing (HoH) DVB subtitle, when HoH subtitle is not enabled from the menu.
- Should be able to store at least 1000 teletext pages in memory and should be able to display teletext pages with user selectable subpages.

12 System clock

The IRD shall have a real-time clock running continuously as specified in the NorDig Unified specification [1]. By default this real-time clock shall be acquired from the network using TDT/TOT tables. In case when IRD is equipped with any kind of timer functionality it shall handle power outages gracefully and after the power is re-connected return to the originating state prior the power outage. In case of PVR IRD for example, when power is re-connected, the IRD shall be able to first wake-up for updating its system clock from the TDT/TOT. After that the IRD shall return to the originating state prior the power outage.

PVR IRD shall handle daylight saving changes also in stand-by, in order to prevent this change to have influence on timer recordings.

13 User Interface

All menus shall be available in at least Finnish, Swedish and English languages. All menus should also be available in all Nordic languages. IRD menu shall be available for the user regardless of the mode the IRD is in (e.g. during recording).

IRD serial number, system software version, sufficient hardware version information and Conax chipset pairing ID shall be available in the menu for all STBs. Conax chipset pairing ID shall be displayed also without smart card inserted. This information should be available in a menu item labeled ‘System information’ or similar.

14 PVR requirements

14.1 General PVR requirements

The PVR IRD is an IRD which is be able to record one service while viewing another, independently even if the services are on different transport streams. the PVR IRD shall support all PVR requirements as specified in the NorDig Unified specification [1]. These requirements specify e.g. basic file management, accurate recording, split recordings, back-to-back recordings, playback functions and PSI/SI signaling.

As a clarification to NorDig Unified specification [1], the PVR shall provide means to warn the user in case the hard drive is running out of free capacity. This includes notifying the user in case of scheduling EPG recordings, manual recordings and one-touch recordings when desired recording time exceeds free capacity. PVR shall never automatically free storage space from hard drive by deleting recorded programs. All delete and format functions shall be user controlled. In case there is an ongoing recording while hard disk runs out of free capacity, then active recording simply stops.

Scheduled recordings have the highest priority in PVR functions. This means that in case of two different scheduled recordings occupy both PVR tuners, the user shall not be able to select a service which is not receivable from two multiplexes PVR is tuned to. This also means that one-touch recordings shall never override reserved recordings. User shall also be warned when overlapping one-touch recording is attempted to reserved recordings.

Scheduled recording IRD internal timer shall refer to UTC time and recording shall not be disturbed by time offset changes (daylight saving changes). The scheduled recordings UI shall be in local time with daylight saving.

The support for CRID as specified in NorDig Unified specification [1] is optional for PVRs released before January 2013, but it is highly recommended. If IRD supports CRID it shall be implemented as specified in NorDig Unified specification [1].

14.2 Parental control

IRD shall support parental rating as specified in the NorDig Unified specification [1] and additionally Finnish IRD shall follow dynamic updates of the EIT Parental Rating descriptor values in EIT present actual table in all recordings during recording and playback.

14.3 Single tuner PVR

In addition to NorDig Unified specification [1] a PVR IRD which is NOT be able to record one service while viewing another, independently even if the services are on different transport streams or the IRD may also be a PVR with one tuner, shall be considered as a single tuner PVRs.. All receivers with the single tuner functionality and have a possibility to connect a mass memory for event recording purposes are considered to be single tuner PVRs. Single tuner PVR shall include at least following functions:

- Receiver shall be able to record at least one scrambled event or unscrambled event.
- Support for scheduled recordings from EPG, manual timer recordings and one-touch recordings where scheduled recording has the highest priority as described in chapter 14.
- User notification procedures for overlapping recordings.
- Time-shift functions as described in NorDig Unified specification [1].
- Basic recording and playback functions as described in NorDig Unified specification [1].
- Basic content management for mass memory including file removal and format options.
- Parental rating control for all recorded events as specified in chapter 14.2.
- Mass memory content protection as defined in Security requirements of digital HDTV receiver for the Finnish market [3] [2].

The support for CRID is optional for single tuner PVRs.

15 IRD accessories and packaging

The IRD package shall include all necessary parts when delivered, the package shall include at least following:

- Installation and user manual at least in Finnish and Swedish
- Remote Control Unit with batteries
- Power cord
- HDMI cable (STB only)
- Model and serial number stamped to device
- Conax chipset pairing ID stamped to device (STB)
- Model and serial number stamped to package box
- Conax chipset pairing ID stamped to package box (STB)