

DRAFT

**Guideline Requirements for
Digital Television Receivers
to Operate with Australian
VHF/UHF DVB-T Transmissions
Including Interoperability Considerations for
Cable and Satellite DTV Services**

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Objective

This document is a set of essential requirements for Australian DVB-T receivers and includes high definition video, AC3 audio and other options and recommended implementations. Interoperability guidelines for satellite and cable operation are also included.

Scope

The reception equipment will be considered in a range of forms and classes.

	Modular Equipment Units¹	Integrated Receiver with Display
Low cost Limited Facility	Typically: Low cost, may operate with existing 4:3PAL TV; single tuner, S-Video, PAL b/band & RF o/p; Mono or stereo audio output; CA Card	Small TVs for kitchen etc, Portable TVs; single tuner; may have 16:9 display; HD may be displayed in SD; single or dual speakers; CA Card
	Range ↑ ↓	range ↑ ↓
Premium Full facility	May have RGB, HD out may feed hi-quality 16:9 display; internal storage Data & IEEE-1394A port; CA Card(s); Modem may have inbuilt DVD	Typically Hi-quality 16:9 display; HD display & may have line doubling for SD input; PIP; Digital & PAL tuner; Data & IEEE-1394 port; CA Card(s); Modem

The table above serves to illustrate the range of facilities that a manufacturer may choose to include in various models to satisfy various market needs.

¹ Modular equipment may be Set-top box style Integrated-Receiver-Decoders or plug-in PC card tuner-decoders.

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Overview

Digital terrestrial television broadcasting (DTTB) based on the DVB-T system has been adopted for Australia. Previous implementations of digital television systems around the world operated on pay satellite and cable systems where compatibility between transmission and reception equipment is generally under the control of a single system operator.

With no single operator in control, there will be multiple free-to-air services and multiple receiver/decoder manufacturers. Consumers will expect a choice of reception equipment from many manufacturers and this equipment will be expected to satisfactorily receive broadcasts from a choice of multiple broadcasters, (each probably using different brand of encoding and transmission equipment).

The international ETSI, IEC/ISO, ITU-R and DVB documents, and Australian Standards (see list attached,) detail the various specifications for the Australian implementation of the DVB-T digital television broadcasting system. These documents give the general operating parameters for receiving equipment.

However there are Australian specific details and unique items about which manufacturers and suppliers need to be aware.

In general, it will be the manufacturer's choice of how their receiver operates over a variety of conditions and their interface through the on-screen display and remote control. These could be in reaction to SI data present in the received transport stream or the action of changing channels.

Nevertheless it should prove valuable to list some of these conditions and note the expected operation of the receiver to clarify the intent of the standards or provide guidance where no clear standard applies.

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Table of Guidelines for Operation of DTV Reception Equipment

The details listed in the tables below are based on the Australian adaption of the DVB-T standards for digital television terrestrial transmissions and are for the guidance of manufacturers and suppliers of Australian DTTB consumer equipment. The Cable and Sat(ellite) columns are shown in the interest of interoperability. Readers are advised that Section 1 is an overview and that reference should be made to the sections following for more complete detail.

LC-STB:	Low cost Modular Equipment
FF-STB:	Full facility Modular Equipment
LC-Rx:	Low cost integrated receiver
FF-Rx:	Full facility integrated receiver

NA	Not Applicable
O	Optional
R	Recommended (should be available)
E	Essential to operate on all services

DTTB	Digital terrestrial TV broadcast
Cable COFDM	Note: This is not a DVB standard and is included for comment only.
Cable QAM	Per DVB-C
Sat QPSK	Per DVB-S

ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
1.0 Basic Features					Broadcasts can be assumed to be DVB compliant within the Australian context including video MP@HL and audio AC3 additions.				
					Further detail can be found in following sections.				
1.10	E	E	E	E	To DVB-T standard with basic Australian requirements	TR 101 190			
1.21	E	E	E	E	Input per AS/NZ standard		E	E	E
1.22	O	O	O	R	For integrated receivers operating in areas where PAL services not yet duplicated on digital				
1.23	R	R	R	R	VHF / UHF Bands III, IV & V; better than 6dB, 7dB & 8dB respectively		R		
1.24	E	E	E	E	Tuning to cover VHF and UHF; also S-Channels	AS (TBA) See Note	E		

² Receiver noise figures are those of a “notional receiver”. The noise figure performance is measured at the receiver’s aerial RF input socket and takes into account the effect if more than one digital and/or analogue tuners are fitted internally. The figure is used for coverage planning –(see http://www.aba.gov.au/what/digital/spec_aba.htm dttbaba.pdf). Other parameters for defining the Australian DTTB “notional receiver” are under consideration. The Notional Receiver information is detailed in Annex A

³ Note: Capability to tune to the S (cable) channels is recommended to enable access to channel shift in MATV systems. Refer SA Consumer Television Interfaces Part1 PAL RF Appendix A Tables A1 & A2. Ability to tune to offset transmissions may be required.

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
1.30	E	E	E	E	Transmissions set to 7MHz channel . Clock 64/8=8MHz	EN 300 744 §4	E		
1.31	E	E	E	E	Primary standard		E		NA
1.32	E	E	E	E	Both modes will be used	EN 300 744 §4	E		
1.33	E	E	E	E	QPSK, 16QAM, 64QAM		E		
1.34	E	E	E	E	The transport stream may include multiple program streams as well as private data and some PIDs may have conditional access applied.	ISO/IEC13818-1	E	E	E
1.35	E	E	E	E	27.71Mb/s payload in a 7MHz channel	EN 300 744 Annex-E (Aus)	E	E	E
1.36	R	R	R	R	Capability to receive OFDM hierarchical mode. Data-rate tables are under revision	EN 300 744 §4.6.2.6			
1.37	E	E	E	E	The unit must be capable of simultaneously decoding from the transport stream, a video stream up to 1920x1080x50i MP@HL, an associated audio stream up to (AC3) 5.1channel and either a teletext or subtitle caption and present the decoded (and scaled if necessary) information in time synced manner to a display device.				
1.4	E	E	E	E	HDTV Services may include 25 and 50 frame/s progressive and 50field interlace formats up to and including 1920pixels/1080lines/50field/s interlaced. (For Line rates refer to Item 7.1 an 7.2 below)	ISO/IEC 13818-2 EN 300 468	O	O	O
1.41	E	E	E	E	Services may include 25 frame/s progressive and 50field/s interlace formats up to and including 720pixels/576lines/50field/s interlaced.	ISO/IEC 13818-2 EN 300 468	E	E	E
1.42	E	E	E	E	MPEG-1 formats at 25 frame/s	ISO/IEC 11172-2	E	E	E
1.51	E	E	E	E	Various implementations are possible which are detailed below.	ISO/IEC 11172-3	E	E	E

⁴ Use of a 6MHz channel mode for Australian Channels 9A & 27 in some locations is being considered but not confirmed. 8MHz operation may be required for interoperability

⁵ Note: MP@HL is specified as “must have” as Government requires a proportion of broadcasters’ programs to be in a high definition format.

⁶ Both MPEG-1 Layer II and AC3 decoders are required as transmissions may have either or both.

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
1.52	R	R	R	R	Backward compatible for interoperability purposes	ISO/IEC 13818-3	R	R	R
1.53	E	E	E	E	AC3 carried as "Private Data" Various implementations are possible	ITU-R Rec. BS.1196	O	O	O
1.61	R	R	R	R	Closed captions may be available as teletext Page801 etc	EN 300 472	R	R	R
1.62	R	R	R	R	Closed captions and other information may be available	ETS 300 743	O	O	O
1.7	-	-	-	-	<u>Cross carriage of SI between TV Networks is not expected.</u>				
1.71	R	E	R	E	One or two slots for Smartcard with Software Implementation under consideration		E	E	E
1.72	E	E	E	E	Control of access to programs per Australian regulatory requirements				
1.73	R	R	R	R	Identify model, software release etc. (eg. for software upgrades, loading APIs)				
1.81	R	E	R	E	2 way data connection. See details below		E	E	E
1.82	R	E	R	E	Internal or capability for external	ACA-TS 2???	E	E	E
1.83	E	E	E	E	To requirements of APIs operating system and upgrades; decoding of program material including MP@HL pictures; decoding and display of OSDs and captions; Storage of 5 station minimum EPGs; "house keeping" items such as storage of tuning tables; Program interactive applications				

⁷ Broadcasts with Closed Captions may be in teletext format and/or in bitmapped subtitle format.

⁸ Closed Caption decoding and display may become mandatory requirements in integrated receivers, and is pending in Australian Government legislation.

⁹ Range of use and type of Conditional Access system subject to outcome of Government, Broadcasters and Industry discussions.

¹⁰ Receiver Parental Guidance requirement currently under discussion

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
1.9	E	E	E	E	Australian Electrical Mains –240V AC 50Hz EMC EMI	ASNZS/3250 –3260 AS 1053 CISPR/E 13			
1.91	O	R	O	R	Scan for stations' extended program information for EPG use.				
1.92	R	R	R	R	Energy swing mode				
2.0 Power on Operations									
2.1	R	R	R	R	Request through on screen set-up menu to enter region for time offset	ETR 162	R	R	R
2.2	R	R	R	R	Return to previous set-up and previous channel (main service if previous program stream selected not available – eg change from multiprogram streams to high definition)		R	R	R
2.3	R	R	R	R	Behavior when new services are introduced - for example identifying a new translator				
2.4	R	R	R	R	Behavior when activated at new location				
3.0 User Operation									
3.1	-	-	-	-	Manufacturer's choice				
3.2	R	R	R	R	Recommended to be easily accessible				
3.3	E	E	E	E	Combination of signal strength and bit-error-rate, essential in setting up receiving antenna (Numerical readout desirable) See Annex – F Informative "Reception Quality OSD Meter".		E	E	E
3.41	R	R	R	R	Less than 1 second for stable picture		R	R	R
3.42	R	R	R	R	Go to main service –display program table, Viewer advised of all programs on newly selected service.		R	R	R
3.5	R	R	R	R	Display "Loss of signal"		R	R	R
3.6	E	E	E	E	Must be either after full "power-on" or from easily accessible menu function		E	E	E

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ITEM	LC- STB	FF- STB	LC- Rx	FF- Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
4.0	COFDM Demodulation and Channel decoding								
4.1	E	E	E	E	Tuner local oscillator frequency is center frequency of selected transmission <u>plus</u> the IF frequency				
4.2	E	E	E	E	Refer to Australian variations to EN 300 744	EN 300 744 §4.2 – 4.8 & Annex E Aust			
4.2	R	R	R	R	Some transmissions may operate in hierarchical mode. The receiver shall be capable of identifying hierarchical transmission and decoding high or low priority bit streams within the range of the receiver's operational carrier to noise ratio. See Item 1.36	EN 300 744 §4.6.2.6			
4.3	-	-	-	-	Message of poor signal See Items 3.3 and 3.5 above				
4.4	Interference Immunity								
4.41	R	R	R	R	Impulse noise can be more severe in the VHF bands, as used in Australia. Ability to reject impulse noise may be affected by receiver AGC performance.				
5.0	Multiplex and Transport Stream								
5.2	E	E	E	E	32 – may affect memory requirement				
6.0	Service Information (SI) Processing								
6.1	E	E	E	E	Refer to Australian amendment table "Standards Australia CT2/C Doc501"	EN 300 468; ETR211			

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
6.2	E	E	E	E		ETR 211 §4 EN 300 468 §4 - 5			
6.3	E	E	E	E		EN 300 468 §4 – 5 ETR 211 §5			
6.4	E	E	E	E		ETR 211 §5 EN 300 468 §6			
6.5	E	E	E	E	To provide minimum EPG display – See Annex xx	EN 300 468			
7.0 Video Decode and Display									
7.1 MPEG Video decoding									
7.10	E	E	E	E	MPEG-1 formats at 25 frame/s, 352 x 288 (SIF);	ISO/IEC 11172-2	E	E	E
7.11	E	E	E	E	1) Pixel x lines @ 25frame/s progressive scan or 50field/s interlaced 720 x 576 ; 544 x 576 ; 480 x 576 ; 352 x 576 ; or. 2) <i>50 frame/s progressive formats</i> 544 x 576 ; 480 x 576 ; 352 x 576 ; 352 x 288	ISO/IEC 13818-2 EN 300 468 table16 ETR154 §5 & Annex A	E	E	E

¹¹ Broadcasters will only use active-lines-in-pictures formats of 1080, 576 and 576/2. This may benefit the interest of lower cost receivers, as a single frequency horizontal line scan systems can be used. (eg. nominally (2 x 15.625kHz) 31.25kHz for HD displays with 576 line pictures scaled up by 2, and 15.625kHz for ED/SD displays where HD pictures are scaled down by 2.) Broadcasters have advised that 720 line formats will not be used.

¹² The MP @ HL decoder must also be able to decode lower MPEG levels such as MP @ LL .For interoperability, 704 pixels x 576 line formats may be used.

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
7.12	E	E	E	E	1) Pixel x lines at 25frame/s progressive scan or 50 field/s interlace 1920 x 1080 line (both “p” at 25frame/s, “i” at 50field/s.) Use of 1280x720line format not expected. Note: 960 x 1080 ; 1280x 1080 ; 1440 x 1080line formats currently under consideration by DVB and will possibly be used. 1035 and 1152 line formats will not be used. 1080 line formats are preferred by Australian DTTB broadcasters. 2) <i>50 frame/s progressive formats</i> 720 x 576line “p” . Use of 1280x720p not expected.	SI-DAT TM EN 300 468 table16 ETR 154 §5 & Annex A	O	O	O
7.2	E	E	E	E	For reproduction on interlaced displays including standard 625line displays, 25frame/s Progressive Formats (presumably from film sources) will need to be output in 50field/s interlaced format	ETR154 §5 & Table 4	E	E	E
7.3	O	O	O	O	Preferred values typically are 0.5, 1.0 and 2.0 also 3/2, 4/3, 2/3		O	O	O
7.4	E	E	E	E	Part of the DVB MPEG system	ISO/IEC 13818-1 2.1.48	O	O	O
7.5	O	R	O	R	In MP@HL decoder, SIF concurrent decoding recommended				
7.6	O	O	O	O	Displayed from a single program stream	ETR 211 §5 EN 300 468 §6.2.13			
7.7					See Section 10 for recommendations				
7.8	Aspect Ratio								
7.81	O	R	O	R	Use of AFD indication of picture “area of interest” is optional	ETR 154 AnnexB			
7.82	E	E	E	E	Broadcasts may have 4:3 or 16:9 pictures as identified by the 4-bit integer aspect_ratio_information `0010` or `0011` respectively. Use of 2.21:1 is not expected	ISO/IEC 13818-2 §6.3.12 ETR 154 §5.1.3			

¹³ Video 25frame/s progressive scan formats may be used because of better MPEG encoding with current equipment. 24 or 23.98frame/s formats will not be broadcast in the Australian 50Hz paradigm.

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ITEM	LC- STB	FF- STB	LC- Rx	FF- Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
7.83					14:9 Pictures Some broadcasts may use this ratio				
7.84					Correct display of 4:3 and 16:9 pictures 16:9 pictures should be capable of being displayed on a 4:3 display. This could be a viewer's choice as letterbox or cutout following pan offsets included in the MPEG program stream (refer to 7.84 below). Manufacturers may also choose to provide overscan and stretch modes for 4:3 pictures on wide-screen displays.	ISO/IEC 13818-2 §6.3.12			
7.85					On 4:3 displays, show full height 4:3 pictures cut from a 16:9 video program stream by use of MPEG-2 Pan & Scan vectors. (This applies to set-top-boxes feeding existing 4:3 display TV sets or integrated digital receivers with 4:3 displays.)	Horizontal (Pan) offset may be available in the program stream. The (16-bit signed) interger frame_centre_horizontal_offset will be included in the video bitstream semantics. If this element is absent from the bitstream then a zero offset (ie. Centred) is assumed. Vertical (scan) offsets (per ETR-154) will not be used. In the case of HD 16:9 program video that is being fed to a SD 4:3 display, the received line structure should be scaled appropriately.	ISO/IEC 13818-2 §6.3.12		
7.86					Frame accuracy of use of Scan offset Shift of picture should be frame accurate with reception of frame_centre_horizontal_offset information.				
7.9					Picture Colorimetry	ETR154 §5			
7.91					Chroma_format Chroma decoding to 4:2:0 format chroma_format will be 01	ISO/IEC 13818-2 §6.1.1.8 §6.3.5; Table 6-5			
7.92					Colorimetry SD and EDTV to EBU/ITU-R Report 624-4; HD to Rec. ITU-R BT. 709-3. Transmitted pictures will be colour balanced to D6500. Manufacturers may choose to alter the display colour temperature.	ISO/IEC 13818-2 §6.3.6; Table 6-7			

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
8.0 Audio – Detail					Lower cost units may operate with a single loudspeaker and in such cases multichannel program audio including stereo will be converted to monaural. Broadcasters may use either MPEG or AC3.				
8.1 MPEG Audio									
8.10 Audio stream using MPEG-1 Layer II	E	E	E	E	Services may be MPEG-1 layer II in single (mono) or dual or joint stereo or stereo modes. Multiple services may be present to support other languages. User should be able to select	ISO/IEC 11172-3	E	E	
8.11 MPEG-1 Layer II sampling rates	E	E	E	E	Broadcasts may use either 32, 44.1 or 48kHz sampling rates – All audio frames have same bit rate		E	E	
8.12 MPEG-2 Layer II	R	R	R	R	Backward compatible basic stereo information should be decodable	ETR154 §6.1	R	R	R
8.13 MPEG-2 (discrete 5.1 channel)	O	O	O	O	Also known as MPEG Multichannel (backward compatible) sound.	ISO/IEC 13818-	O	O	O
8.2 AC3	E	E	E	E	Included in the DVB TS as “private data”. AC3 may be used for mono, stereo, stereo with ProLogic [®] surround sound or discrete 5.1 channel surround sound. Other features of AC3 follow:	ITU-R Rec. BS.1196, ATSC A/52	O	O	O
8.21 AC3- Number of channels -As many as required (for multiple languages) Complete Main services each 1 to 5.1 channels plus associated services	?	?	?	?	Each CM service can have a complete mix or only Music Effects Dialogue; Visually Impaired; Hearing Impaired Additionally the following have over-ride capability Commentary; Voice Over & Emergency Not all AC-3 decoders may have ME & D decode & mix capability. C & VO services operate assuming a “ducking” capability which receivers may not have.	A/53 §6			
8.22 AC3 Karaoke mode	NA	NA	NA	NA		A/52			
8.23 Dual AC3 decoders	O	R	O	R		Dolby			

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
8.24	E	E	E	E	Receiver Sampling frequency Range Digital audio sampled at a frequency of 32 kHz, 44.1 kHz or 48 kHz, locked to the 27 MHz system clock. The 48 kHz audio sampling clock is defined as: 48 kHz audio sample rate = (2 ÷1125) × (27 MHz system clock)	Refer Aust change to ATSC A53 Clause 5.2 Sampling Frequency			
8.25	E	E	E	E	Receiver Decodable Bit rate A main audio service, or an associated audio service which is a complete service (containing all necessary program elements) shall be encoded at a bit rate less than or equal to 640 kbps. A single channel associated service containing a single program element shall be encoded at a bit rate less than or equal to 128 kbps. A two channel associated service containing only dialogue shall be encoded at a bit rate less than or equal to 256 kbps. The combined bit rate of a main service and an associated service which are intended to be decoded simultaneously shall be less than or equal to 768 kbps.	Refer Aust change ATSC A53 Clause 5.3 Bit rate]			
8.26	E	E	E	E	AC3 audio streams will be identified as a private_stream_1). Note: there may be other AC3 streams and/or other private data streams such as sub-title data with the same stream_id also present. The stream_id will be 0xBD (private_stream_1) The stream_type will be 0x81 (user private) The private_data_specifier will be 0xD0 (Dolby Private) For the component_descriptor : The stream_content is 0x02 (audio) and component_tag is 0xBD Other changes refer to Australian Submissions to DVB	ETR 154 AUST ITU-R BS.1196			
8.3 Audio Identification & Control									
8.31	E	E	E	E	OSD should briefly display choice when present				
8.42	E	E	E	E	If several audio streams present in either MPEG-1 layer II and/or AC3				

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
8.43	?	?	?	?	If a program stream changes its audio delivery from MPEG-1 layer II to AC3 or vice-versa, Switch should be automatic and muted				
8.44	O	R	O	R	To ensure satisfactory decoding, audio phase response must be maintained on stereo output with decoded MPEG or AC3 This applies to audio streams \geq 224kbps				
8.45	?	?	?	?	For visually impaired				
8.46	R	R	R	R	To maintain perception of same volume from different sources	MPEG: ETR154 §6 AC3: A/52			
8.47	O	R	O	R	Ability for user to set through OSD menu.				
8.48	R	R	R	R	Maximum Picture-Sound mis-alignment (Lip Sync) \pm 20mSec				
9.0	Operating Software								
9.1	?	?	?	?	API	BHTML; Java; MHEG-5			
10.0	Interactivity and On Screen Display								
10.1	?	?	?	?	Remote Control	No comment			
10.12	O	R	O	R	Capability to operate interactively	Interactive material may be present in broadcasts			
10.2	OSD								
10.21	E	E	E	E	Video Planes – Two (video & OSD)	Minimum of two video planes supported (video & OSD). The OSD shall be provided as solid, translucent or clear. (Refer Sect ?			

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ITEM	LC-STB	FF-STB	LC-Rx	FF-Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
10.3 Teletext					There may be more than one Teletext data stream in a Transport Stream and more than one stream in a Packetised Elementary Stream. The PMT teletext_descriptor tag value is 0x56	EN 300 468 §6. Table 12 EN 300 472			
10.31	O	R	O	R	If fitted, OSD must indicate to viewer what teletext streams are available in a service. PIDs as identified in PMT of the PSI. stream_type is 0x06 (private data). Each stream identified by different data_identifier	EN 300 468 §6.2.32 EN 300 472 and revisions	O	O	O
10.32	R	R	R	R	If fitted, essential that equivalent line21 and 334 be decoded for closed captions	EN 300 742 §1.	O	O	O
10.33	R	R	NA	NA	If fitted, Teletext should be reinserted on VBI lines of video output for display on teletext capable TVs connected to the STB/IRD.	EN 300 742 §1. ITU-R BT.653-2 EBU SPB 492	O	O	O
10.34	E	E	E	E	If fitted, in teletext assigned colour and positioned according to row number.				
10.35	E	E	E	E	Accuracy of Closed captions with picture	EN 300 742 §1.			
10.36	E	E	E	E	Australian Closed Captions for Hearing Impaired are normally on page 801. Broadcasts containing only this information as Teletext in the DVB data Transport Stream may not have complete information but should be able to be decoded for display.	ETR 211 §4.2.6.4			
10.4 Bit-Mapped Subtitles					Subtitles, logos and other graphical elements may be coded and carried in DVB bitstreams. This format could also include Closed Captions for the Hearing Impaired	EN 300 743 EN 300 468 §6. Table 12 & 6.2.30			
10.41	O	R	O	R	See note				
10.42	E	E	E	E	256 colour recommended but at manufacturer's choice dependent on memory allocation				

¹⁴ Refer previous footnote 8 – Requirement for decoding and display of closed captions is under consideration by Industry and Government.

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ITEM	LC- STB	FF- STB	LC- Rx	FF- Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
10.43	E	E	E	E	Display on 4:3 and 16:9 pictures				
10.44	E	E	E	E	Closed Caption Display ¹⁴				
10.45	E	E	E	E	Time accuracy of display of CC ±40mS				
10.5 EPG									
10.51	-	-	-	-	General Australian DTTB broadcasters will only transmit their own SI and EPGs. <u>Cross carriage of SI between TV Networks is not expected.</u> Receiver manufacturers will need to make their own decisions on memory size and allocation for viewers convenience in referring to previously captured EPG data.				
10.52	-	-	-	-	Use of EPG Flush Broadcasters will not use EPG Flush function if this erases EPGs of other broadcasters				
10.53	?	?	?	?	Broadcaster Generated EPGs Under discussion with broadcasters				
10.54	?	?	?	?	Receiver Generated EPGs Under discussion with broadcasters				
10.55	E	E	E	E	Use of Now/Next (present/following) Required for basic navigation in digital supplied by EIT				
10.56	?	?	?	?	Use of Extended program information				
10.57	R	R	R	R	Use of Running status Table Needed to identify changed program duration – User choice, selected by OSD menu.				
11.0 Data Broadcasting						EN 300 468 §6.2.6 –7 EN 301 192			
11.1	O	E	O	E	Access to data Service There may be more than one Data Broadcast stream in a Transport Stream.	ETR 162			
11.2	O	O	O	O	Data interface If data interface fitted, options for interface given in Section 15.0 Interfaces and Connectors				
12.0 Parental Guidance						ETR-154(Aus)			

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ITEM	LC- STB	FF- STB	LC- Rx	FF- Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
13.0 Conditional Access¹⁵						ETR 289; DVB A011			
13.1 Common Interface Connector	R	E	R	E	Software implementation of CA is recommended with at least one smartcard.				
13.2 Additional socket	O	R	O	R					
14.0 Copyright Protection on Outputs¹⁶					Activated by copyright bit descriptor				
14.1 Activation	E	E	E	E	Activated by copyright bit descriptor				
14.2 Digital outputs	?	?	?	?	IEEE 1394 under international discussion				
14.3 High definition Analogue outputs	?	?	?	?					
14.4 Standard definition analogue outputs	?	?	?	?					
15.0 Interfaces and Connectors									
15.1 RF Input / Output									
15.11 RF input	E	E	E	E	IEC169-2 female, 75 ohm.				
15.12 RF modulated PAL composite output	O	O	NA	NA	If fitted, complies with AS-				

¹⁵ Refer footnote 9

¹⁶ Use and type of Copyright Protection system(s) subject to Broadcaster and Industry discussions.

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ITEM	LC- STB	FF- STB	LC- Rx	FF- Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
15.2 Base-band analogue video Connectors	E	E	O	O	Where fitted, option are:				
15.21 High Definition R, G and B or Y,Pr and Pb	O	R	O	O	Consumer Television Interfaces, Part 2	Analogue Interfaces	SA XXXX Part2		
15.22 PAL composite	O	O	O	O	Consumer Television Interfaces, Part 2	Analogue Interfaces IEC48B Sec.316 (aka RCA or Cinch)	SA XXXX Part2		
15.23 S-Video Component in / out	O	O	O	O	Consumer Television Interfaces, Part 2	Analogue Interfaces	SA XXXX Part2		
15.24 SCART Component or RGB in / out	O	O	O	O	(aka Petritelevision or Euroconnector)	Consumer Television Interfaces- Part 2 Analogue Interfaces	SA XXXX Part2		
15.3 Base band Audio output connectors	E	E	O	O	Where fitted, option are:				
15.3 Separate audio	O	O	O	O	One (mono) to six connectors as required;	IEC48B Sec.316 aka RCA phono (Cinch) or Scart for Mono Stereo	SA XXXX Part2		
15.4 Audio AC3 bit stream output	O	O	O	O	To feed separate external Dolby Digital AC3	5.1 channel decoder	Refer Dolby		
15.5 Digital Program Stream IEEE-1394A or 1394B	O	R	O	R	Transport or Program stream				
15.6 Data connectors					Where fitted, options are:	SA XXXX Part 3			
15.63 IEEE-1394A or 1394B	O	R	O	R	Could be two-way transport stream, program stream or data. In the case of transport stream or program stream, the requirements of copyright protection must be applied. (aka "FireWire", "I-Link")	SA XXXX Part 3 ; IEC-61883-1; IEC-61883-4 1998-02			
15.61 Serial port	O	O	O	O	9 pin D male,(EIA-RS-232C) Capable of connection to an external modem or a PC.	SA XXXX Part 3			
15.64 USB	O	O	O	O					

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ITEM	LC- STB	FF- STB	LC- Rx	FF- Rx	Remarks	Reference Standards	Cable C OFDM	Cable QAM	Sat QPSK
15.62	O	O	O	O	25-pin D female IEEE 1284	SA XXXX Part 3			
16.0 Back Channel Return Path	R	E	R	E	For interactive applications option are:				
16.1	O	R	O	R	Modem Capability Software and Hardware capability either by internal or external modem.				
16.2	O	O	O	O	Type of Operation – Internal or External Connection via Telephony PSN, GSM or other.				
16.3	O	O	O	O	Internal Modem				
16.4	O	O	O	O	Internal Modem Port Connector RJ11				
17.0 System Software Upgrade									
	R	R	R	R	Ability to upgrade				
17.1	?	?	?	?	Via DTTB transmission If this option is enabled, then the broadcaster would require that the download would not interfere with any other receivers and be in a “background” mode to the affected units.				
17.2					Other Methods				
	?	?	?	?	Via RS-232C Serial port				
17.3	?	?	?	?	Via Parallel data port				
17.4	?	?	?	?	Via Modem Port				
17.5	?	?	?	?	Via IEEE1394 port				
18 Memory Expansion									
	R	R	R	R	Ability to expand Future applications				

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ANNEX A: Notional DTTB Receiver Specification - Summary

Digital Terrestrial TV

Note: Notional Receiver specifications are used for emission planning purposes.

1. *Receiver Noise Figure (Measured at receiver RF 75 ohm input socket)*

VHF Band III	6dB max
UHF Band IV	7dB max
UHF Band V	8dB max

2. *Tuner Selectivity*

7MHz Channel	sufficient to reject Analogue or Digital services on the lower and upper adjacent channels which are 40 dB higher than wanted digital service being received
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3. *AFC Range stability* *sufficient to accept incoming signal with +/- 1 KHz*

4. *Minimum Decodable Carrier to Noise dependent)* *19 dB (for 64QAM @ 2/3 FEC) (Modulation*

5. *Maximum Decodable Carrier to Noise* *32 dB*

6. *Signal level range (Receiver input 75ohm)*

VHF Band III	100dBuV max
UHF Band IV	100dBuV max
UHF Band V	100dBuV max

7. *Receiver RF Input Return Loss* *-14 dB for VHF and UHF*

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ANNEX-B References:

Document	Edition- Version (date)	Title	Cross Reference
ISO/IEC 11172-x		ISO/IEC standards 11172-1 (Systems), 11172-2 (Video), 11172-3 (Audio), 11172-4 (Compliance Testing), and 11172-5 (Technical Report).	
ISO/IEC 13818-1	1996	Generic Coding of Moving Pictures and Associated Audio Information –Recommendation H.222.0 Part 1 – Systems	
ISO/IEC 13818-2	1996	Generic Coding of Moving Pictures and Associated Audio Information –Recommendation H.222.0 Part 2 – Video	
ISO/IEC 13818-3		Generic Coding of Moving Pictures and Associated Audio Information –Recommendation H.222.0 Part 3 – Audio	
ETSI EN 300 468	1.3.1 (02/98)	Specification for Service Information (SI) in DVB systems	DVB Blue Book A038
ETSI ETR 211	2 (08/97)	Guidelines on implementation and usage of Service Information (SI)	DVB Blue Book A005 Rev2
ETSI ETR 162	Latest available from www	Allocation of Service Information (SI) codes for DVB systems	
ETSI EN 300 472	1.2.1 (08/97)	Specification for conveying ITU-R System B Teletext in DVB bitstreams	
ETSI ETS 300 743	1 (09/97)	Subtitling systems	DVB Blue Book A009
ETSI ETR 154	3 (10/97)	Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications	DVB Blue Book A001R4
ITU-R BS. 1196	1995	Audio Coding for Digital Terrestrial Television Broadcasting	
Standards Australia			

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ANNEX-C

Abbreviations & Glossary

5.1 Channel Sound

A Five point one channel sound system is actually 6 channels of stereo surround sound. The first 5 channels are centre speaker then left, right, rear left and rear right. The extra point one refers to the reduced bandwidth “sub-woofer” or very low frequency channel which does not have to be directionalized because the human ear has no direction capability below about 100 Hertz.

Advanced home 5.1 channel “*surround sound*” systems can source the six channels either from information derived from incoming stereo (two channel) using systems such as Dolby ProLogic™ or, for best performance, from separate 5.1 channel information carried in advanced digital audio systems such as Dolby AC3 (5.1 version) or MPEG-2 (5.1 / 7.1 channel version). These are available from Laser disc, DVD and from digital broadcasts signals. Other systems in use for home theatre applications include Lucas Film THX, Digital Theatre Sound (DTS) and Advanced Audio Coding (AAC).

AC3

A proprietary digital sound system developed (and patented) by Dolby. It can carry multiple channels, stereo with ProLogic and 5.1 discrete channel. Also known as Dolby Digital, variants of the system are used in movie theatres, domestic laserdisk and DVD and in the US ATSC and Australian DVB-T digital broadcast systems. Decode systems can include a second decoder for special requirements.

Advanced Television Systems Committee (ATSC)

The ATSC is a private sector organization formed in 1983 and with headquarters in Washington D.C., USA. Its purpose is the development of voluntary standards for the entire spectrum of advanced television systems. The ATSC is composed of over fifty member corporations, associations and educational institutions. It has developed a variety of technical standards including the ATSC Digital Television Standard which grew out of a combination of parts of various systems put forward by a consortium of various manufacturers and other interests known as the “Grand Alliance”. Its basis is a system using 8-VSB modulation to transmit MPEG-2 video and AC3 audio approved by the FCC for US broadcasters in December 1996. The MPEG-2 video can include 18 different formats including several HDTV formats. In addition to the development of standards, the ATSC is also developing implementation strategies for advanced television and data broadcasting.

American National Standards Institute (ANSI)

A US standards body.

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CA	<p>Conditional Access. Refers to methods which scramble or encrypt the program or private data so that it can be received only by “authorised” receivers. While a number of different “private” schemes using “smartcards” have been used by Pay-TV operators working primarily via satellite, the arrangements for terrestrial services are different because free-to-air services should be receivable without CA authorisation. CA systems are currently (Jan’99) under consideration for the ATSC standard.</p> <p>In Europe, a Common Scrambling Algorithm was designed to minimise the likelihood of piracy attack over a long period of time. By using the Common Scrambling Algorithm system in conjunction with the standard MPEG data transport and selection mechanisms it is possible to incorporate in a DVB transmission the means to carry multiple messages which all enable control of the same scrambled broadcast but are generated by a number of different CA systems. This 'Simulcrypt' technique allows both the delivery of one Programme to a number of different decoder populations that contain different CA systems, and also for the transition between different CA systems in any decoder population, for example to recover from piracy.</p> <p>The 'Multicrypt' option is also available, facilitated by the Common Interface (DVB-CI) specification proposed for standardisation by CENELEC (European Committee for Electrotechnical Standardisation). The CA Module may operate in conjunction with a smartcard or with a PCMCIA card as popularly used with lap-top PCs.</p>
Carrier-to-Noise Ratio (C/N or CNR)	<p>A measurement of the received carrier power relative to the power of background noise at the receiver input.</p>
CENELEC	<p>European Committee for Electrotechnical Standardisation.</p>
Colour Look-Up Table (CLUT)	<p>For DTV On-Screen-Displays, the CLUT is a look-up table of colour values for translating an object’s pseudo-colours into screen display colours. It is a way of simplifying the amount of data required to display an object but has the limitation that only 4, 16 or 256 colour values are allowed somewhat like early PC EGA graphics systems. Not all decoders may support a CLUT with 256 entries. A palette of four colours would be enough for graphics that are basically monochrome, , like subtitles, while a palette of sixteen colours allows for cartoon-like coloured objects.</p>
COFDM	<p>A method of Coded OFDM used by DVB for digital terrestrial television broadcasting.</p>
DVB (Digital Video Broadcast)	<p>The Digital Video Broadcast is a consortium of over 200 manufacturers, research institutes, and broadcast organisations principally located in Europe but spread throughout the world. The Project has produced a series of interlinked broadcasting standards for satellite, cable and terrestrial. Through other European groups such as “ACTS” the work is now going on to interlink computer networking and multimedia.</p>
DVB-T	<p>The DTB-T terrestrial digital television broadcasting specification is based on a transmission system of COFDM carrying program and data as MPEG packets. It was approved by the Steering Board, in December 1995 and subsequently accepted by ETSI as a European standard. The work was based on a set of user requirements produced by the Terrestrial Commercial Module of the DVB Project. DVB members contributed to the technical development of DVB-T through the DTTV-SA (Digital Terrestrial Television - Systems Aspects) of the Technical Module. The European Projects SPECTRE, STERNE, HD-DIVINE, HDTVt, dTTb, and several other organisations, developed system hardware and produced results which were fed back to DTTV-SA.</p>
Dolby	<p>A US based company specializing in proprietary compression and noise reduction techniques for audio transmission and recording.</p>
Dolby Pro-logic™©	<p>A method of encoding rear “surround” sound information in a 2 channel stereo audio signal</p>

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Dynamic Range	The ratio between the greatest signal power that can be transmitted over a multichannel analog transmission system without exceeding distortion or other performance limits, and the least signal power that can be utilized without exceeding noise, error rate or other performance limits.
EDTV	Extended Definition TV. Refers to mainly wide screen formats using the current scanning rates but not limited by bandwidth restrictions or artifacts of modulated PAL or NTSC; - usually by full digital connection from camera to baseband input on the home receiver (component Scart/Peritel or S-Video connection).
Electronic Industries Association (EIA)	A US voluntary body of manufacturers which, among other activities, prepares and publishes standards.
EPG	Electronic Program Guide
European Telecommunication Standards Institute (ETSI)	The major European standards publishing body.
Forward Error Correction (FEC)	Methods of improving the ability to recover error-free data from a transmission or storage system usually by adding extra data (about the payload data) before transmission. For example in the DVB system a 188Byte MPEG-2 transport stream packet may have added a further 16 bytes for error correction making a new packet size of 204bytes.
Header	In data transmission, the header is protocol control information located at the beginning of a protocol data unit.
Hierarchical Modulation	A method of transmission and reception of a radio-frequency carrier where part of the information carried is capable of being more reliably received than the main body under difficult reception conditions. In the case of DVB-COFDM transmissions, two data streams can be modulated onto a 16 or 64 QAM signal and the high priority stream protected by stronger FEC and/or a shift of the modulation pattern (alpha factor). Refer to ETSI EN 300 744
Hierarchical Coding	Refers to a possible feature of MPEG-2 where the video and/or audio information can be coded and scaled spatially or temporally. That is where a base or course layer and a fine detail layer can be sent separately. For example, the Simple, Main, SNR Scalable, Spatially Scalable and High profiles have a hierarchical relationship. Therefore the syntax supported by a 'higher' profile includes all the syntactic elements of 'lower' profiles (e.g., for a given level, a Main profile decoder shall be able to decode a bitstream conforming to Simple profile restrictions). Refer ISO/IEC 13818 –1,2,3.
High Definition Television (HDTV)	High definition television has a resolution of approximately twice that of standard television in both the horizontal (H) and vertical (V) dimensions and a wide screen picture aspect ratio (H : V) of 16:9. ITU-R Recommendation 1125 further defines "HDTV quality" as the delivery of a television picture which is subjectively identical with the interlaced HDTV studio standard.
Hybrid Fiber/Coax (HFC) System	A broadband bidirectional shared-media transmission system using fiber trunks between the headend and the fiber nodes, and coaxial distribution from the fiber nodes to the customer locations.
Hyper-Text-Transfer Protocol (http)	An Internet protocol for transferring text files with layout information.
IEEE	See Institute of Electrical and Electronic Engineers.
IETF	See Internet Engineering Task Force.

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Institute of Electrical and Electronic Engineers (IEEE)	<p>An international voluntary organization based in the US which, among other things, sponsors standards committees and is accredited by the American National Standards Institute.</p> <p>Various standards such as IEEE 1394 (a.k.a. Firewire) have recently been developed for domestic high-speed digital interlinking of TV cameras, recorders and computer equipment.</p>
International Electrotechnical Commission (IEC)	<p>An international standards body based in Europe.</p>
International Organization for Standardization (ISO)	<p>An international standards body, commonly known as the International Standards Organization.</p>
International Telecommunication Union - Radiocommunication (ITU-R)	<p>An international standards body and a part of the ITU, based in Geneva which is the recognised standards publisher for broadcast radio and television transmission standards and standards on program interchange.</p>
Internet Engineering Task Force (IETF)	<p>A body, based in Europe, responsible, among other things, for developing standards used in the Internet.</p>
Local Area Network (LAN)	<p>A non-public data network in which serial transmission is used for direct data communication among data stations located on the user's premises.</p>
Master Headend	<p>A headend which collects television program material from various sources by satellite, microwave, fiber and other means, and distributes this material to Distribution Hubs in the same metropolitan or regional area. A Master Headend may also perform the functions of a Distribution Hub for customers in its own immediate area.</p>
MHEG	<p>Multimedia and Hypermedia information coding Expert Group. A standards working group of the ISO/IEC Joint Technical Committee 1- Sub Committee 29/ Working Group 12 who are developing coding of multimedia and hypermedia for information technology applications including digital TV. This relates to on-screen text and picture displays for menus, interactive TV etc.</p>
Moving Picture Experts Group (MPEG)	<p>A voluntary body ISO/IEC Joint Technical Committee 1- Sub Committee 29 / Working Group 11 which has and continues to develop standards for digital compressed moving pictures and associated audio. Their standards are published in the ISO/IEC 11172 and ISO/IEC 13818 series of documents.</p>
MPEG-1 and MPEG-2	<p>These are the most common video and audio compression schemes now in use. MPEG-1 was used for lower data rate video on early CDi and VideoCDs. MPEG-2 provides for better quality (at higher data rates) and is used in a variety of professional and consumer applications from SDTV to HDTV on terrestrial, satellite and cable broadcast and Digital Video (Versatile) Disks. MPEG-4 and MPEG-7 are further schemes for compression under development</p>
MPEG packets	<p>A way of breaking up the continuous stream of MPEG compressed video, audio and other data for ease of passing through various transmission systems such as broadcast. The raw transport packet is 188-bytes including a 4 byte header which contains a "PID" for identification. The 184byte payload may include information on the format of the contents (PSI).</p>
National Television Systems Committee (NTSC)	<p>A US Committee formed in the late 1940s and '50s which defined the analog color television broadcast standard used today in North America.</p>
OSD	<p>On Screen Display of menu for user's setup of receiver's operating parameters. Also refers to display of choices and interaction with receiver and/ or program</p>
Orthogonal Frequency Division Multiplexing (OFDM)	<p>A modulation system which uses a very large number of separate radio frequency carriers each of which carry a small proportion of the total information content to be sent. Also used in DAB (Digital Audio Broadcasting), OFDM has good performance in a very strong multipath (ghosting) environment. DVB based digital television broadcasts use Coded OFDM.</p>

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Packet Identifier (PID)	A unique integer value used to identify elementary streams of a program in a single- or multi-program MPEG-2 stream. Carried in each packet header (13 bits)
PAL	Phase Alternate Line. An analog encoding system for color television. Compatible with analog monochrome systems of the same scanning rates, it has a high frequency subcarrier to carry two color component signals, similar to the principles used in NTSC but alternates the phase of one of the color signals so that the receiver may correct color errors with a delay line. It was developed by AEG Telfunken Laboratories in Hanover, Germany.
Program-Specific Information (PSI)	In MPEG-2, normative data necessary for the demultiplexing of Transport Streams and the successful regeneration of programs.
Program Stream	In MPEG-2, a multiplex of variable-length digital video and audio packets from one or more program sources having a common time-base.
Protocol	A set of rules and formats that determines the communication behavior of layer entities in the performance of the layer functions.
QAM	See Quadrature Amplitude Modulation.
QPSK	See Quadrature Phase-Shift Keying.
Quadrature Amplitude Modulation (QAM)	A method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding.
Quadrature Phase-Shift Keying (QPSK)	A method of modulating digital signals onto a radio-frequency carrier signal using four phase states to code two digital bits.
Radio Frequency (RF)	In broadcast and cable television systems, this refers to electromagnetic signals in the range 5 to 1000 MHz.
Reverse Channel	A path for return information from the end-user. Necessary for full interactivity. In Cable systems, the signal flows towards the headend, away from the subscriber; equivalent to Upstream.
SCART plug	Large flat multipin plug - socket usually on larger domestic TVs and European VCRs. Used for analogue audio and video baseband interconnect and for "S-Video" or component video connections which bypass the resolution loss and artifacts caused by disassembling the component colour signals from composite PAL or NTSC. (Also known as Peritel peripheral television interconnect or Euroconnector).
Service multiplex and transport	In an MPEG system, "service multiplex and transport" refers to the division of the digital data stream into "packets" of information and the means of uniquely identifying each packet or packet type. Also the appropriate methods of multiplexing these video data stream packets with audio data stream packets and ancillary data stream packets into a single data stream consisting of a sequence of 188-byte transport packets.
Set-Top-Box (STB)	A modular unit for decoding video, audio, and data services physically separated from a display device. Also known as an IRD (Integrated Receiver Decoder)
Standard Definition Television (SDTV)	This term is used to signify a <i>digital</i> television system in which the quality is approximately equivalent to that of broadcast or cable NTSC and PAL as seen in the customer's TV receiver. Note: the term Conventional Definition Television (CDTV) has been used to signify the <i>analog</i> PAL or NTSC television system as defined in ITU-R Recommendation 470.

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Surround Sound	Refers to listening environments where loudspeakers are positioned around the listener(s). Besides the front loudspeakers, other loudspeaker(s) are positioned to the rear and sometimes to the sides. The intention is to recreate the ambience and directionality of the original scene being reproduced. Sound systems employing surround sound can recreate such effects by processing the program stereo channels; or better stereo with phase encoded material such as Dolby ProLogic™; or best, from a discrete multichannel system of at least 6 channels including a low frequency sub-woofer channel.
Service Information (SI)	In an MPEG data stream, Service Information (SI) is included within an MPEG-2 Transport Stream to assist the user in selection of services and/or events within the digital multiplex, and so that the receiver can automatically configure itself for the selected service. Information carried within SI allows for identification of services or events for the user and can also provide information on services carried by different multiplexes and even other networks. SI data complements the PSI tables by providing other data to aid automatic tuning of decoders, and information intended for display to the user. In general, SI augments and extends the relevant Program Specific Information (PSI) specified in ISO/IEC 13818-1 (MPEG-2 Systems), the Program Association Table (PAT) and Program Map Table (PMT).
S-Video plug	A domestic analogue baseband video inter connection on a small plug where the video is in a separated form so as to avoid the resolution loss and artefacts caused by PAL or NTSC. (Also known as S-VHS)
Transmission Link	The transmission connection between interconnected points.
Transmission Medium	The medium on which information signals may be carried; e.g., radio waves, optical fiber, coaxial cable or twisted-wire pairs
Transport Stream	In MPEG-2, a packet-based method of multiplexing one or more digital video and audio streams having one or more independent time bases into a single stream.
Upstream	The direction from the subscriber location toward the headend.

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ANNEX-E

Typical Receiver Block Diagram

To be added

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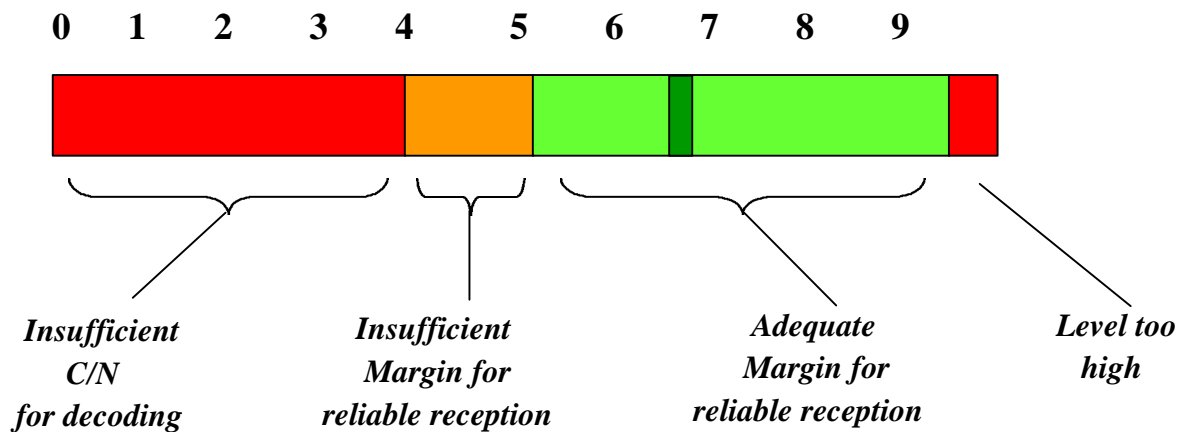
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ANNEX-F - Informative
Reception Quality OSD Meter

Satisfactory reception of digital terrestrial television is dependent upon total signal quality. Satisfactory reception cannot be guaranteed on signal strength alone. A tuning meter should not be activated by signal strength or AGC level alone as there are other effects such as multipath (ghosting) which even with a strong signal strength may result in error levels that renders the signal undecodable.

Shown below is a suggested display of decoding margin for use on DTTB receivers and decoding equipment to be used by either a Technician or Viewer.

Numerical Scale:



Note : The display must be the result of both the receiver level, C/N and decoded bit error rate, for the display to be meaningful in the DVB-T COFDM environment. A numerical scale is considered essential to quantify the reception quality for reference back to the manufacturer in cases of user enquiry.

This type of indicator will allow :

- Proper installation of fixed antennas;
- Alignment of portable or “rabbit ears” antenna;
- Correct distribution system outlet levels.