

SPECIFICATIONS
FOR FREE-TO-AIR DTT RECEIVER
in GREECE as per DIGEA
BROADCASTING STANDARDS
MINIMUM REQUIREMENTS

V1.0

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4. REFERENCES

1. INTRODUCTION

1.1 Purpose of the document

This document describes the minimum requirements in both hardware and functionality for stand alone set top boxes used in Greece for free to air DTT reception of the Digea programs. In terms of hardware it applies also for integrated receivers where applicable.

The set top box (“the Receiver”), must be compliant with section 1 through section 3.

It is intended that a receiver conforming to this profile should comprise part of a domestic installation, in conjunction with an external, wideband terrestrial UHF and/or VHF antenna input. The receiver will connect to the television display (or integrated in a TV set), and possibly other domestic equipment.

1.2 General description of the receiver

The Receiver must be capable to receive signals in both VHF and UHF bands. It must be capable to receive channels in both Mpeg2 and Mpeg4 streams, at least at Standard Definition. No Conditional Access capability is covered in this document.

The output format is PAL B/G.

The Receiver must comply with E.M.C. and safety requirements of European Union and must carry the CE mark.

The Receiver must be capable to operate in SFN environment according to TS 101 191 V1.4.1 Mega-frame for Single Frequency Network synchronization.

The suggested specifications take into consideration all currently used DVBT transmission standards in Europe so that the consumer will not need an additional box/receiver in order to receive all platforms in Greece.

2. HARDWARE REQUIREMENTS

2.1 R.F. Tuner

The Receiver must allow reception of all channels in UHF (Band IV-V with bandwidth 8 MHz) and reception of all channels in VHF (Band III with bandwidth 7 MHz).

R.F. Tuner	
Input connector	IEC 169-2, Female
Loop-through connector	IEC 169-2, Male (STB only)
Input signal level	-10 to -70 dbm
Frequency range V.H.F.	174-230 MHz
Bandwidth in V.H.F.	7 MHz
Frequency range U.H.F.	470-862 MHz
Bandwidth in U.H.F.	8 MHz

2.2 Demodulator

The Receiver must allow reception of the DVB-T signals with all combinations of following parameters, according to EN 300 744 v1.6.1.

Demodulator	
Demodulation	QPSK, 16-QAM or 64-QAM according to EN 300 744 v1.6.1
Carrier Mode	2k, 8k
FEC Rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard Interval	1/4, 1/8, 1/16, 1/32
S.F.N. operation	According to TS 101 191 V1.4.1 Mega-frame for Single Frequency Network synchronization

2.3 Demultiplexer

The Demultiplexer of the Receiver must comply to the MPEG-2 transport layer defined in ISO/IEC 13818-1 and ETSI TS 101 154 v1.8.1.

Must be able to decode an ISO/IEC 13818-1 stream with data rates up to 32 Mbits.

Also must support variable bit-rate elementary streams within a constant bit-rate transport stream.

Demultiplexer	
Compliance	ISO/IEC 13818-1, ETSI TS 101 154 v1.8.1
Data rate	up to 32 Mbits

2.4 Video decoder

The Receiver must be able to decode both Mpeg2 and Mpeg4 (H.264 AVC) streams, for all available multiplexers, in Standard Definition.

There must be no synchronization problems between video and sound output (No LipSync error allowed).

2.4.1 Mpeg2 decoder

The Receiver must be able to decode Mpeg2 streams in Standard definition according to the following specifications:

Mpeg2 decoder (Standard Definition)	
Transport stream	ISO/IEC 13818-1, ETSI TS 101 154 v1.8.1
Video profile and level	ISO/IEC 13818-2 Main Profile@Main level, ETSI TS 101 154 v1.8.1
Video resolution	720x576
Audio decoding	ISO/IEC 13818-3 (Mpeg1 layer 2) , ETSI TS 101 154 v1.8.1
Audio mode	Mono, Stereo

2.4.2 Mpeg4 decoder

The Receiver must be able to decode Mpeg4 (H.264 AVC) streams in Standard definition according to the following specifications:

Mpeg4 decoder (Standard Definition)	
Transport stream	ISO/IEC 13818-1, ETSI TS 101 154 v1.8.1
Video profile and level	ISO/IEC 14496-10 Main profile@L3.0 , ETSI TS 101 154 v1.8.1
Video resolution	Standard definition: 720x576
Audio decoding	ISO/IEC 13818-3 (MPEG1 Layer 2) , ETSI TS 101 154 v1.8.1
Audio mode	Mono, Stereo

2.5 Interfaces

The Receiver must have at minimum the following interfaces:

Interfaces	
Output format	PAL-B/G
R.F. Connectors (Input, Loop-through)	IEC 169-2, Female and IEC 169-2 Male
Video Connectors	1. 21-pin Euro SCART with both Composite and RGB for output to display. 2. RCA composite output.
Audio Connectors	RCA audio outputs (Left, Right)

2.6 General

The Receiver must have an A.C. input of 230V \pm 10%, 50Hz \pm 5%.

The Receiver must comply with safety and E.M.C. standards of E.U and must carry the CE mark.

In case of external power supply, it must be also compliant with the above standards.

The A.C. plug must be any of the types described in the following table:

GENERAL	
Input Voltage	230V \pm 10%
Input frequency	50Hz \pm 5%
A.C. plug	CEE 7/4 or CEE 7/7 or CEE 7/16 or CEE 7/17
E.M.C. (Radiated R.F.)	CE compliant
E.M.C. (R.F. Immunity)	CE compliant

2.7 Hardware Requirements Summary Table

R.F. Tuner	
Input connector	IEC 169-2, Female
Loop-through	IEC 169-2, Male (STB only)
Input signal level	-10 to -70 dbm
Frequency range V.H.F.	174-220 MHz
Bandwidth in V.H.F.	7 MHz
Frequency range U.H.F.	470-862 MHz
Bandwidth in U.H.F.	8 MHz
Demodulator	
Demodulation	QPSK, 16-QAM, 64-QAM according to EN 300 744 v1.6.1
Carrier Mode	2k, 8k
FEC Rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard Interval	1/4, 1/8, 1/16, 1/32
S.F.N. operation	According to TS 101 191 V1.4.1 Mega-frame for Single Frequency Network synchronization
Demultiplexer	
Compliance	ISO/IEC 13818-1, ETSI TS 101 154 v1.8.1
Data rate	up to 32 Mbits
Mpeg2 decoder (Standard Definition)	
Transport stream	ISO/IEC 13818-1, ETSI TS 101 154 v1.8.1
Video profile and level	ISO/IEC 13818-2 Main Profile@Main level, ETSI TS 101 154 v1.8.1
Video resolution	720x576
Audio decoding	ISO/IEC 13818-3 (Mpeg1 layer 2) , ETSI TS 101 154 v1.8.1
Audio mode	Mono, Stereo
Mpeg4 (H.264 AVC) decoder (Standard Definition)	
Transport stream	ISO/IEC 13818-1, , ETSI TS 101 154 v1.8.1
Video profile and level	ISO/IEC 14496-10 Main profile@L3.0 , ETSI TS 101 154 v1.8.1
Video resolution	Standard definition: 720x576
Audio decoding	ISO/IEC 13818-3 (MPEG1 Layer 2), ETSI TS 101 154 v1.8.1
Audio mode	Mono, Stereo
Interfaces	
Output format	PAL B/G
R.F. connectors	IEC 169-2, Female and IEC 169-2 Male
Video Connectors	1. 21-pin Euro SCART with both Composite and RGB for output to display. 2. RCA composite output.
Audio Connectors	RCA audio outputs (Left, Right)
GENERAL	
Input Voltage	230V+-10%
Input frequency	50Hz +-5%
A.C. plug	CEE 7/4 or CEE 7/7 or CEE 7/16 or CEE 7/17
E.M.C. (Radiated R.F.)	CE compliant
E.M.C. (R.F. Immunity)	CE compliant

3. FUNCTIONAL REQUIREMENTS

3.1 Aspect Ratio

The Receiver must be able to receive broadcasts in any valid format and send appropriate signals to TV set according to ETSI EN 300 294 v1.4.1.

The Receiver must also provide signals to SCART connector for correct aspect ratio recognition by TV set (pin8).

Aspect ratio	
WSS compliance	ETSI EN 300 294 V1.4.1

3.2 E.P.G.

The Receiver must provide an Electronic Program Guide (EPG) service, based on the ETSI EN 300 468 v1.8.1 standard,. The EPG must present the program title, start time, duration, a description and parental rating for the currently running program and future programs over the following seven days. The EPG must present program or event information for all channels on all available multiplexes, provided by the broadcaster.

The Receiver must support the Latin/Greek complete character set from code table ISO/IEC 8859-7.

E.P.G.	
Compliance	ETSI EN 300 468 v1.9.1
Character set	ISO/IEC 8859-7

3.3 TeleText

The Receiver must employ at least one of following options for displaying Teletext information:

- By insertion of the Teletext data in the VBI of the analogue CVBS video output. Insertion shall conform to ITU-R BT.653-3 and to requirements defined in ETS 300 706, level 1.5, according to ETSI EN 300 472 V1.3.1
- By presentation of Teletext within the menus of the receiver.

The Receiver must support the Latin/Greek complete character set from code table ISO/IEC 8859-7.

TeleText	
Teletext transport	ETSI EN 300 472 V1.3.1
Teletext transcoding	ETS 300 706 level 1.5, to ITU-R BT.653-3
Character set	ISO/IEC 8859-7

3.4 Subtitles

The Receiver must be capable of decoding and displaying DVB subtitle services which are transmitted in conformance with ETSI EN 300 743 v1.3.1, including complete character set from code table ISO/IEC 8859-7 (Latin/Greek character set).

Subtitles	
Subtitles compliance	ETSI EN 300 743 v1.3.1
Character set	ISO/IEC 8859-7

3.5 Software Upgrade

The Receiver must provide at least one mechanism for upgrading system software.

Preferably, the receiver shall accept software upgrades in accordance with ETSI TS 102 006 v1.3.2, simple profile.

Software Upgrade	
Compliance	ETSI TS 102 006 v1.3.2, simple profile

3.6 Language support

The Receiver must support both English and Greek language in accordance of the user preference. Both languages must be supported in all menus in the Receiver software.

3.7 Tuning/Scanning procedures

The Receiver must be able to receive and store channels based on tuning parameters in PSI/SI tables.

The Receiver must assign a Service Number to all Channels received based on the LCN allocated to that channel by the Broadcaster (where LCN is available from Broadcaster).

The Receiver must allow a manual search where frequency is entered by user. The Receiver shall tune to this frequency, search all available DVB-T modes, add new services and replace existing services in the service list.

3.8 Functional Requirements Summary Table

Aspect ratio	
WSS compliance	ETSI EN 300 294 V1.4.1
E.P.G.	
Compliance	ETSI EN 300 468 v1.9.1
Character set	ISO/IEC 8859-7
TeleText	
Teletext transport	ETSI EN 300 472 V1.3.1
Teletext transcoding	ETS 300 706 level 1.5, to ITU-R BT.653-3
Character set	ISO/IEC 8859-7
Subtitles	
Subtitles compliance	ETSI EN 300 743 v1.3.1
Character set	ISO/IEC 8859-7
Software Upgrade	
Compliance	ETSI TS 102 006 v1.3.2, simple profile
Language support	
The Receiver must support both English and Greek language in accordance of the user preference. Both languages must be supported in all menus in the Receiver software.	

4. REFERENCES

1. **ETSI EN 300 744**, Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television
2. **ETSI TS 101 191**, Digital Video Broadcasting (DVB); DVB mega-frame for Single Frequency Network (SFN) synchronization
3. **ETSI TS 101 154**, Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream
4. **ISO/IEC 13818-1**, Information Technology - Generic Coding of Moving Pictures and Associated Audio; Part 1: Systems
5. **ISO/IEC 13818-2**, Information Technology - Generic Coding of Moving Pictures and Associated Audio; Part 2: Video
6. **ISO/IEC 13818-3**, Information Technology - Generic Coding of Moving Pictures and Associated Audio; Part 3: Audio
7. **ISO/IEC 14496-10**, Information technology - Coding of audio-visual objects - Part 10: Advanced Video Coding
8. **ETSI EN 300 294**, *625-line television Wide Screen Signalling (WSS)*
9. **ISO/IEC 8859-7** Character Set-modern greek language (monotonic orthography)
10. **ETSI EN 300 468**, "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems"
11. **ETSI EN 300 472**, Digital Video Broadcasting (DVB); Specification for conveying ITU-R System B Teletext in DVB bitstreams
12. **ETSI ETS 300 706**, Enhanced Teletext specification
13. **BT.653-3** Teletext systems
14. **ETSI EN 300 743**, "Digital Video Broadcasting (DVB); Subtitling systems"
15. **ETSI TS 102 006**, Digital Video Broadcasting (DVB); Specification for System Software Update in DVB Systems