Digital Video Broadcasting (DVB);

Interfaces for DVB Integrated Receiver Decoder (DVB-IRD)

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Contents

1 Scope

The present document is an application standard, identifying recommended interfaces for connections of Digital Video Broadcast Integrated Receiver Decoder (DVB-IRD) equipment. If a recommended interface is supported, then the full specification of that interface, which may include options, applies. Interfaces not mentioned in the present document are not excluded, and especially interfaces which are under development at the time of drafting the present document may be added at a later stage.

For mechanical and electrical details of the interfaces, reference is made to existing standards of IEC or CENELEC wherever possible, or standards which are known to be in an advanced state of development.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 ETSI documents

[1] ETS 300 158: "Satellite Earth Stations and Systems (SES); Television Receive Only (TVRO-FSS) Satellite Earth Stations operating in the 11/12 GHz FSS bands".

[2] ETS 300 249: "Satellite Earth Stations and Systems (SES); Television Receive-Only (TVRO) equipment used in the Broadcasting Satellite Service (BSS)".

[3] ETS 300 784: "Satellite Earth Stations and Systems (SES); Television Receive-Only (TVRO) satellite earth stations operating in the 11/12 GHz frequency bands".

[4] EN 300 473: "Digital Video Broadcasting (DVB); Satellite Master Antenna Television (SMATV) distribution systems".

2.2 IEC Publications

[5] IEC 60169-2: "Radio frequency connectors. Part 2: coaxial unmatched connector".

[6] IEC 60169-24: "Radio Frequency connectors. Part 24: Radio frequency coaxial connectors with screw coupling, typically for use in 75 Ohm cable distribution systems (type F)".

[7] IEC 60807-9: "Rectangular connectors for frequencies below 3 MHz. Part 9: Detail specification for a range of peritelevision connectors".

[8] IEC 61938: "Audio, video and audiovisual systems - Interconnections and matching values - Preferred matching values of analogue signals"

[9] IEC 60933-1: "Audio, video and audiovisual systems - Interconnections and matching values. Part 1: 21 contact connector for video systems, application No 1".

[10] IEC 60933-5: "Audio, video and audiovisual systems - Interconnections and matching values. Part 5: Y/C connector for video systems – Electrical matching values and description of the connector".

[11] IEC 60958: "Digital audio interface".

[12] IEC 61030: "Audio, video and audiovisual systems - Domestic digital bus (D2B)".

[13] IEC 61319-1: "Interfaces for satellite receiving equipment - Part 1: Europe".

[14] IEC 61883: "Consumer electronic audio/video equipment – Digital interface".

[15] IEC 61937: "Digital audio - Interface for non-PCM encoded audio bitstreams applying 60958".

2.3 CENELEC Publications

[16] EN50049-1: "Domestic and similar electronic equipment interconnection requirements: Peritelevision connector".

[17] EN50157-1: "AVLink, Part 1: General".

[18] EN50221: "Common Interface Specification for Conditional Access and other Digital Video Broadcasting Decoder Applications".

2.4 Industrial publications

[19] PCMCIA: "PC Card Standard, - Personal Computer Memory Card International Association, Sunnyvale, Cal".

[20] IEEE 1394: "Standard for a high performance serial bus".

[21] IEEE 1284 (1994): "Signalling method for a bi-directional parallel peripheral interface for personal computers".

[22] ANSI/EIA RS232: "Interface between data terminal equipment and data-circuit terminating equipment employing serial binary data interchange".

[23] HDMI: "High Definition Multimedia Interface" - http://www.hdmi.org/support/support.asp, HDMI Spec Informational Version.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

CATV (Community Antenna Television system): a system designed primarily to provide sound and television signals to communities

SMATV (Satellite Master Antenna Television system): a system designed to provide sound and television signals to the households of a building or group of buildings. Two system configurations are defined in EN 300 473 [4] as follows:

- SMATV system A, based on transparent transmodulation of QPSK satellite signals into QAM signals to be distributed to the user;
- SMATV system B, based on direct distribution of QPSK signals to the user, with two options:
  - SMATV-IF distribution on the satellite IF band (above 950 MHz);
  - SMATV-S distribution on the VHF/UHF band, for example the extended S-band (230 MHz to 470 MHz).

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADSL	Asymmetric Digital Subscriber Loop
BSS	Broadcast Satellite Service
CA	Conditional Access
CENELEC	Comité Européen de Normalisation ELECtrotechnique
CVBS	Composite Video, Blanking and Sync
DTE/DCE	Data Terminal Equipment / Data Communication Equipment
DVB	Digital Video Broadcasting
DVC	Digital Video Cassette
FSS	Fixed Satellite Service
HDMI	High Definition Multimedia Interface
IEC	International Electrotechnical Commission
IRD	Integrated Receiver Decoder
LNB	Low Noise Block converter
PSTN	Public Switched Telephone Network
RLE	Run Length Encoding
VPS	Video Programming System

4 Interface requirements for DVB-IRDs

4.1 RF input in the satellite IF range

This clause specifies the interface in case of individual dish antenna or SMATV-IF (analogue and digital) installations.

4.1.1 Polarization switch, LNB's band and first IF input selection

The control signal to switch the polarization, the control signal to select the upper or lower band of the LNB, and the first IF input from the LNB to the DVB-IRD shall be as specified in IEC 61319-1 [13], clause 5. The connector is specified in IEC 60169-24 [6] (also known as the F-connector), the impedance is 75 Ohm, and output return losses are specified in ETS 300 158 1], ETS 300 249 [2] and ETS 300 784 [3].

4.1.2 Azimuth control of a polar mount dish antenna

The control signal for the azimuth control of a polar mount dish antenna shall be as specified in IEC 61319-1 [13], clause 6.

4.2 RF input/output in the VHF/UHF range

4.2.1 RF input

The RF input in the case of CATV installations, SMATV System A or SMATV-S installations, or in the case of terrestrial reception shall be as follows:

- covers the VHF/UHF frequency bands (47 MHz to 862 MHz);
- 75 Ohm coaxial;
- connector IEC 60169-2 [5], female connector on the DVB-IRD.

4.2.2 RF output

The interface for RF output signals shall be as specified in subclause 4.2.1 except for the connector which is IEC 60169-2 [5] male version. RF output shall support either loop through only, or RF modulated output from the DVB-IRD, or both. In case of loop through the modulator should output the VHF/UHF frequency bands as specified in subclause 4.2.1. The channel to be used for RF modulated output depends on local circumstances, i.e. occupation of available channels by either terrestrial or cable programmes (see informative Annex B). It is recommended to support the channel range 21 to 69 in UHF.

4.3 Modem interface

4.3.1 PSTN modem

A PSTN modem interface provides a low bitrate data channel.

4.3.1.1 External modem

4.3.1.1.1 DTE/DCE interface

The modem shall support:

a) An interface lead with a 9-pin D-type connector with male shell and female contacts, using ANSI/IEARS232 [22] interface levels. The DVB-IRD is seen as the Data Termination Equipment (DTE) and shall be equipped with the mating connector. The pin arrangement shall be as follows:

Pin Number	Name	Function	Source
1	DCD	Carrier Detection	modem
2	RXD	Receive Data	modem
3	TXD	Transmit Data	IRD
4	DTR	Data Terminal Ready	IRD
5	GND	Signal Ground	
6	DSR	Data Set Ready	modem
7	RTS	Request To Send	IRD
8	CTS	Clear To Send	modem
9	RI	Ring Indicator	modem

b) Auto-mode selection CCITT V.21, V.23 (1200/75), V.22 or V.22 bis transmission protocols (one of these as a minimum). Asynchronous working with one or two stop bits and with or without parity shall be possible. It is recommended that V.32, V.32 bis and V.34 support is included and that the design does not preclude the addition of future enhancements.

c) Hardware flow control (RTS/CTS) in addition to XON/XOFF flow control.

d) Control by the Hayes AT command set.

e) Auto-calling, CCITT V.25 auto-answering and an auto-logon feature.

f) CCITT V.42 error correction and V.42 bis data compression.

NOTE: V.25 and V.42 are optional extras for a modem interface.

4.3.1.1.2 PSTN link interface

The modem shall be equipped with RJ11 (6 contact) female connector with pin arrangement as follows:

Pin number	Name	Function
1		
2		
3	PSTN	electrical connection
4	PSTN	electrical connection
5		
6		

NOTE 1: PSTN (GSTN) working implies using a PSTN interface cable terminating in a plug which meets national connection requirements given in ETS 300 001 (NET4). The compliance to this interface implies the need for the product to be subjected to type approval by the national regulatory body.

NOTE 2: Approval under the Terminal Equipment Directive 91/263/EEC.

4.3.1.2 Integrated modem

The internal modem shall meet the same requirements as the external modem as specified in 4.3.1.1 with the exception of providing the 9 pin interface connector as specified in 4.3.1.1.1 a).

4.3.2 CATV and SMATV modem

A CATV/SMATV modem interface provides a bi-directional data channel. The suitable data rate and the kind of operation depend on the performance of the service.

4.3.2.1 DTE/DCE interface

An external modem shall be equipped with an interface lead with a 9 pin D-type connector with male shell and female contacts, using ANSI/IEA RS232 [22] interface levels. The DVB-IRD is the Data Termination Equipment (DTE) and shall be equipped with the mating connector. The pin arrangement shall be as follows:

Pin number	Name	Function	Source
1			
2	RXD	Receive Data	modem
3	TXD	Transmit Data	IRD
4			
5	GND	Signal Ground	
6			
7			
8			
9			

4.3.2.2 RF interface to CATV/SMATV network

The RF interface for both an internal and an external modem shall be as follows:

- impedance 75 Ohm;
- connector IEC 60169-2 [5], female on the modem.

It is recommended to use for the carrier in the forward direction:

a) for CATV, SMATV System A and SMATV-S modem the range of 47 MHz to 862 MHz;

b) for SMATV-IF modem the range above 850 MHz.

It is recommended to use for the carrier in the return direction the range of 5 MHz to 65 MHz (to be confirmed).

The choice of carrier frequencies depends on the design of the CATV/SMATV network.

4.4 Video signals

Analogue video signal output can be either baseband in RGB, Y/C (S-VHS) or CVBS format, or modulated on an RF carrier. The MPEG2 Transport Stream is used to transmit the digital video signals on a high performance serial interface, see subclause 4.6.3.

4.4.1 Baseband signals

Matching values for analogue baseband signals 1 V_{pp}. For detailed specifications see any one of the following standards:

- IEC Interface: Preferred matching values for analogue signals.
- IEC 60933-1 [9]: 21 contact connector.
- EN 50049-1 [16]: Peritelevision connector.
- EN50157-1 (17]: AVLink.

NOTE 1: All CVBS related features from PAL services (like VPS, Teletext) which are available on the Peritelevision connector should be made available as usual.

For Teletext there are two possibilities:

- the set top box contains a Teletext decoder, and provides Teletext output as OSD in RGB output signals;
- the set top box does not contain a Teletext decoder, in which case Teletext information is provided in the VBI of the CVBS output signal.

NOTE 2: The DVB standard also provides 2.21:1 (20:9) aspect ratio as an option for the receiver. While displays will only support 4:3 or 16:9, the aspect ratio 2.21:1 will result in a letterbox format. The Peritelevision connector provides following options to deal with aspect ratio 2.21:1 (20:9):

- 6 V signal level on function switch contact 8 is specified to correspond to 16:9 aspect ratio (see EN50049-1 [16]). For optional 20:9 signals the IRD should apply suitable processing as detailed in ETR 154 for display on 4:3 and 16:9 display units.
- the protocol on contact 10 (see EN50157-1 [17]) includes the option to signal ">16:9". This, when used by the DVB-IRD, will result in proper handling by a 16:9 display unit.

Connectors:

- Peritelevision connector, see IEC 60807-9 [7].
- Phono connector.
- 4 contact connector, see IEC 60933-5 [10].

4.4.2 RF modulated signals

Video output is also implied in the RF modulated output as described in subclause 4.2.2.

4.5 Audio signals

Audio signal output can be in either analogue or digital format, or modulated on RF carrier.

4.5.1 Analogue audio signals

Matching values: 0,5 to 2 V, see IEC 61938 [8]: Preferred matching values for analogue signals.

Connector:

- Peritelevision, see IEC 60807-9 [7].
- Phono connector.

4.5.2 Digital audio signals

4.5.2.1 Linear PCM coded audio signals

This shall be compliant to IEC 60958 [11].

NOTE: In case the DVB-IRD includes a surround sound decoder, the multiple analogue outputs thereof would require a number of Phono outputs as identified in subclause 4.5.1.

4.5.2.2 Compressed and multi-channel audio signals

If compressed and multi-channel audio signals are transmitted on IEC 60958 [11] then the application specification is based on IEC 61937 [15].

For other MPEG based audio signal transport see subclause 4.6.3.

4.5.3 RF modulated signals

Audio output (mono only) is also implied in the RF modulated output as described in subclause 4.2.2.

4.6 Digital audio video interface

"The High-Definition Multimedia Interface is provided for transmitting digital television audiovisual signals from DVD players, set-top boxes and other audiovisual sources to television sets, projectors and other video displays. HDMI can carry high quality multi-channel audio data and can carry all standard and high-definition consumer electronics video formats. Content protection technology is available. HDMI can also carry control and status information in both directions"

The HDMI output may be used to carry video or combined AV signal originated in the IRD, to a display or to an AV switching box connecting display and audio amplifiers.

In case the IRD is also providing AV switching functionality, one or more HDMI input may be used on the IRD to connect other sources to the same display to which the IRD is connected.

4.6.1 Overview of the HDMI concept

Quoted from the HDMI 1.0 Specification informational version, chap. 3:

"HDMI system architecture is defined to consist of Sources and Sinks. A given device may have one or more HDMI inputs and one or more HDMI outputs. Each HDMI input on these devices shall follow all of the rules for an HDMI Sink and each HDMI output shall follow all of the rules for an HDMI Source.

As shown in *Figure 3-1 HDMI Block Diagram* the HDMI cable and connectors carry four differential pairs that make up the TMDS data and clock channels. These channels are used to carry video, audio and auxiliary data. In addition, HDMI carries a VESA DDC channel. The DDC is used for configuration and status exchange between a single Source and a single Sink. The optional CEC protocol provides high-level control functions between all of the various audiovisual products in a user's environment.

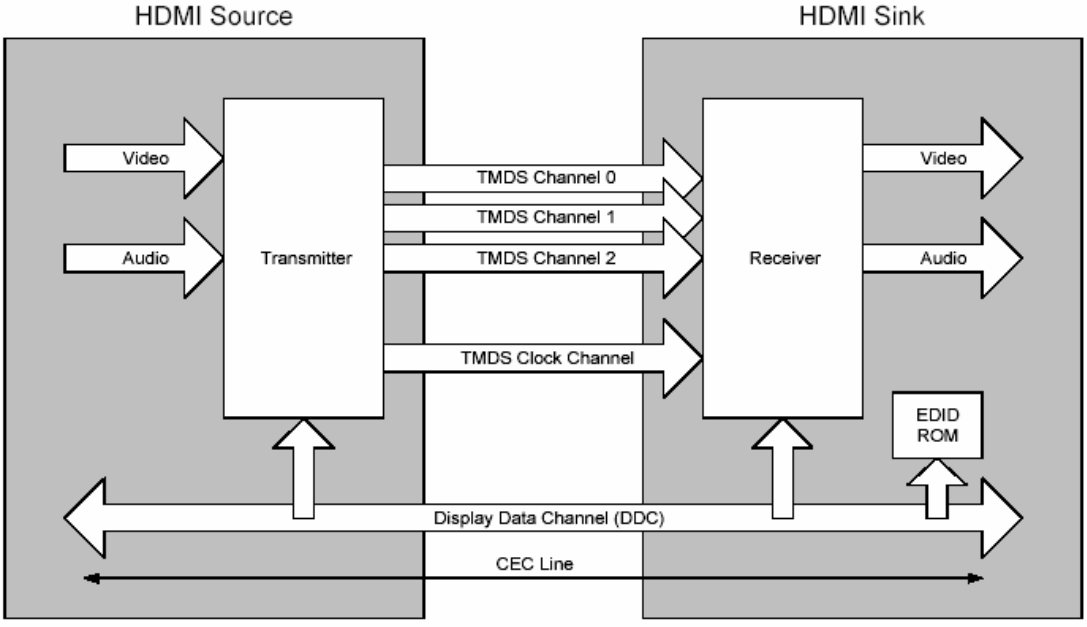


Figure 3-1 HDMI Block Diagram

Audio, video and auxiliary data is transmitted across the three TMDS data channels. The video pixel clock is transmitted on the TMDS clock channel and is used by the receiver as a frequency reference for data recovery on the three TMDS data channels.

Video data is carried as a series of 24-bit pixels on the three TMDS data channels. TMDS encoding converts the 8 bits per channel into the 10 bit DC-balanced, transition minimized sequence which is then transmitted serially across the pair at a rate of 10 bits per pixel clock period.

Video pixel rates can range from 25MHz to 165MHz. Video formats with rates below 25MHz (e.g. 13.5MHz for 480i/NTSC) can be transmitted using a pixel-repetition scheme. The video pixels can be encoded in either RGB, YC_BC_R 4:4:4 or YC_BC_R 4:2:2 formats. In all three cases, up to 24 bits per pixel can be transferred."

4.6.2 Supported AV Formats

Quoted from the HDMI 1.0 Specification informational version, par 6.2.1:

"Some of the following support requirements are in addition to those specified in EIA/CEA-861B.

• An HDMI Source shall support at least one of the following video format timings:

- 640x480p @ 59.94/60Hz
- 720x480p @ 59.94/60Hz
- 720x576p @ 50Hz

• An HDMI Source that is capable of transmitting any of the following video format timings using any other component analog or uncompressed digital video output, shall be capable of transmitting that video format timing across the HDMI interface.

- 1280x720p @ 59.94/60Hz
- 1920x1080i @ 59.94/60Hz
- 720x480p @ 59.94/60Hz
- 1280x720p @ 50Hz
- 1920x1080i @ 50Hz
- 720x576p @ 50Hz

• An HDMI Sink which accepts 60Hz video formats shall support the 640x480p @ 59.94/60Hz and 720x480p @ 59.94/60Hz video format timings.

• An HDMI Sink which accepts 50Hz video formats shall support the 640x480p @ 59.94/60Hz and 720x576p @ 50Hz video format timings.

• An HDMI Sink which accepts 60Hz video formats, and which supports HDTV capability, shall support 1280x720p @ 59.94/60Hz or 1920x1080i @ 59.94/60Hz video format timings.

• An HDMI Sink which accepts 50Hz video formats, and which supports HDTV capability, shall support 1280x720p @ 50Hz or 1920x1080i @ 50Hz video format timings.

• An HDMI Sink that is capable of receiving any of the following video format timings using any other component analog or uncompressed digital video input shall be capable of receiving that format across the HDMI interface.

- 1280x720p @ 59.94/60Hz
- 1920x1080i @ 59.94/60Hz
- 1280x720p @ 50Hz
- 1920x1080i @ 50Hz "

4.6.3 Supported Audio Formats

Quoted from the HDMI 1.0 Specification informational version, par. 7.3:

"If an HDMI Source supports audio transmission across any output, then it shall support HDMI audio transmission. Exceptions to this rule for Sources with Type B connectors are found in Appendix B.

If an HDMI Source supports any HDMI audio transmission, then it shall support 2 channel L-PCM using an IEC 60958 Subpacket structure, with either 32kHz, 44.1kHz or 48kHz sampling rate and a sample size of 16 bits or more.

An HDMI Source is permitted to transmit L-PCM or encoded audio data at sample rates of 32kHz, 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz and 192kHz using either IEC 60958 format or IEC 61937 format.

If an HDMI Sink supports audio reception across any input, then it shall support audio reception from all HDMI inputs.

An HDMI Sink that is capable of accepting any audio format is required to accept two channel IEC 60958-formatted L-PCM audio at sample rates of 32kHz, 44.1kHz, and 48kHz.

For EIA/CEA-861B references to Sources, .Basic Audio. is defined as two channel L-PCM audio at sample rates of 32kHz, 44.1kHz, *or* 48kHz, with a sample size of at least 16 bits. For EIA/CEA-861B references to DTV devices, Basic Audio is defined as two channel L-PCM audio at sample rates of 32kHz, 44.1kHz, *and* 48kHz. There is no sample size usage restriction for DTV devices.

An HDMI Sink may optionally accept audio at sample rates of 88.2kHz, 96kHz, 176.4kHz and/or 192kHz using either IEC 60958 format or IEC 61937 format, and should indicate these capabilities in the E-EDID data structure."

4.6.4 Connector

Quoted from the HDMI 1.0 Specification informational version, 4.1.1:
A device's external HDMI connection shall be presented via one of the two specified HDMI connectors, Type A or Type B. This connector can be attached directly to the device or can be attached via a cable adapter that is shipped with the device.

The Type A connector carries all required HDMI signals, including a single TMDS link. The Type B connector is slightly larger and carries a second TMDS link, which is necessary to support very high-resolution computer displays requiring dual link bandwidth.

A passive cable adapter between Type A and Type B connectors is specified. "(

An IRD may adopt the connector type A both for input and output, as all the foreseen television formats may be supported over a single TDMS link

4.7 Data signals output

Three interface options are envisaged, each accommodating a range of bitrates and services, i.e. ANSI/IEA RS232 [22] for low bitrates, IEEE 1284 [21] for bitrates up till about 10 Mbit/s, and IEEE 1394 [20] for bitrates of 100 Mbit/s or more such as MPEG-2 compressed streams or other multimedia data streams.

4.7.1 Low bitrate serial data port

This interface can be used to interface to a PC or to other terminals for data including still video images and software.

The DVB-IRD shall be equipped with an interface with a 9 pin D-type socket with female contacts, using ANSI/EIA RS232 [22] interface levels. The pin arrangement shall be as follows:

Pin number	Name	Function	Source
1			
2	RXD	Receive Data	IRD
3	TXD	Transmit Data	PC
4			
5	GND	Signal Ground	
6			
7	RTS	Request To Send	PC
8	CTS	Clear To Send	IRD
9			

The IRD is seen as a Data Communication Equipment (DCE) and the PC (or other terminal) is seen as the Data Terminal Equipment (DTE).

The interface shall support full duplex data transfer, and hardware flow control (RTS/CTS) as well as XON/XOFF flow control.

This interface supports standard data rates up till 19,2 kbit/s, whereas, dependent on length and quality of cable, data rates up till in the order of 100 kbit/s are also possible.

4.7.2 High bitrate parallel data port

This interface shall comply with IEEE 1284 [21] standard, with some restrictions as presented in the following subclauses.

4.7.2.1 Connector type

Mandatory: Equipment connector: one D-type connector, **female** 25 pins.

Optional: An additional D-type connector, **female** 25 pins (see 4.6.2.5 for more details).

4.7.2.2 Electrical requirements

The electrical characteristics of the parallel interface shall be compliant with the level 2 electrical interface defined in IEEE 1284 [21].

4.7.2.3 IEEE1284 modes

The IEEE 1284 [21] standard specifies 2 non-exclusive possibilities for a device: it may either be "Host" or "Peripheral". When a device is host, it is the initiator and master of a data exchange sequence. On the contrary, a "Peripheral" device requires a peer "Host" to set up and manage a data transfer sequence.

In case of the DVB-IRD, most applications require the IRD to behave only as a "Peripheral". That is the case for all applications where the IRD is connected to a computer. Therefore, it is mandatory for the IRD to act at least as a peripheral. The set of specific "peripheral – modes" to be supported is detailed furthermore in the next clause.

For some special applications, however, the IRD would have to behave like a "Host". This is for instance the case if the IRD should directly control a printer. This requirement will remain optional, since it is always possible to implement these with the IRD being only "Peripheral", by using a computer as an intervening host. The optional "Host – mode" to be supported is detailed furthermore in subclause 4.6.2.5.

4.7.2.4 IEEE1284 Peripheral – modes (mandatory)

The IRD shall handle as a **Peripheral** the following modes defined in IEEE 1284 [21]: "compatibility mode", "Nibble mode", "Byte mode" and "ECP mode". The handling of the "EPP mode" is not required.

The identification of the external function (device ID string) is not required.

For the "ECP mode" the handling of the RLE (Run Length Encoding) compression is not required.

During "negotiation – phase", the IRD shall adapt the interface to the mode requested by the peer host, within its own possibility range (i.e.: EPP not supported). The data transfer path and direction to be set up, depends on the negotiated mode, and may change dynamically between "forward" (Host to Peripheral) and "reverse" (Peripheral to Host), as specified in more detail in the IEEE 1284 [21].

Data rates up to 10 Mbit/s shall be supported.

The pin arrangement (on the DVB-IRD 25 pin D female connector) shall be as follows:

Pin no	Name	Function	Signal direction (seen from IRD side; see note)
1	strobe	indicates new data	i
2	D0	Data bit 0	i/o
3	D1	Data bit 1	i/o
4	D2	Data bit 2	i/o
5	D3	Data bit 3	i/o
6	D4	Data bit 4	i/o
7	D5	Data bit 5	i/o
8	D6	Data bit 6	i/o
9	D7	Data bit 7	i/o
10	/ACK	/Acknowledge	o
11	BUSY	Busy	o
12	PError	Paper Empty	o
13	SELECT	Select	o
13	SELECT	Select	o
14	AUTOFD	Auto Feed	i
15	/FAULT	/Fault	o
16	/INIT	/Initialize	i
17	/SELECTIN	/Select In	i
18	GND	Ground	
19	GND	Ground	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
NOTE: "i" = input only; "o" = output only; "i/o" = bi-directional: the direction at a given moment depends on the mode-context.			

4.7.2.5 IEEE1284 Host mode (optional)

Only the Host Compatible mode is required, to allow a one way data transfer path towards a printer device. The implication on the signal directions (of the 25 pin D male connector) is as following:

Pin no	Name	Function	Signal direction (seen from IRD side)
1	strobe	indicates new data	o (see note 1)
2	D0	Data bit 0	o
3	D1	Data bit 1	o
4	D2	Data bit 2	o
5	D3	Data bit 3	o
6	D4	Data bit 4	o
7	D5	Data bit 5	o
8	D6	Data bit 6	o
9	D7	Data bit 7	o
10	/ACK	/Acknowledge	i
11	BUSY	Busy	i
12	PError	Paper Empty	i
13	SELECT	Select	i
14	AUTOFD	Auto Feed	o
15	/FAULT	/Fault	i
16	/INIT	/Initialize	o
17	/SELECTIN	/Select In	o
18	GND	Ground	
19	GND	Ground	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
NOTE 1: "i" = input only; "o" = output only.			

Recommendations: In case the DVB-IRD implements the optional Host-compatible mode it is recommended to use one of the 2 following possibilities:

1) Use a dedicated 2nd D-type **female** connector, (25 pins). In that case thus, the IRD will have 2 D-type 25 pin connectors: one used for all the applications requiring the "Peripheral" behaviour; and another one used for the application(s) requiring the "Host" behaviour with a one-way data path (e.g.: data flows only from IRD to printer): it is up to the manufacturer to provide clear markings on the rear panel so as to identify the use of each D-type connector.

2) The interface uses the same (single) D-type connector, whether the IRD is Peripheral or Host: the switching between Host or Peripheral (with respect to pin signal directions) is application dependent, and care shall be taken to foresee timeouts and appropriate buffering, in case an accidental Host (IRD in host-mode) to Host (PC) connection would be established. By default, the IRD shall be in Peripheral-mode (after power-up), and only goes to Host-mode when the user selects the corresponding application.

NOTE 2: Applications requiring other IRD Host-modes than "Compatible" (e.g.: an IRD connected to a 2nd IRD via IEEE 1284) are outside the scope of the present specification, but not in contradiction with it.

4.7.3 High speed serial interface

This interface provides high bitrate of 100 Mbit/s or more for MPEG-2 compressed streams or other multimedia data streams.

The physical, link and transport layers shall be compliant to the cable environment as specified in IEEE 1394 [20]. The following options apply to the DVB-IRD application:

- bitrates of 100 Mbit/s shall be supported. Extension to 200 Mbit/s or 400 Mbit/s is optional;
- the power lines may be deleted, reducing the interface to a 4 wire version for CE A/V purposes, see IEC 61883 [14];
- preferably an IRD should show at least two IEEE 1394 ports;

- the IRD shall be capable of acting as root and performing the isochronous resource management functions.

The packet layer and data format for MPEG2 transport capability shall be compliant to IEC 61883 [14].

4.8 Physical interfaces for control signals

Control signals may be embedded in interfaces for data signals, in which case the physical interface for those data signals also apply to the control signals.

Other interfaces, dedicated to the transmission of control signals, may also be used. These interfaces, if used, shall be compliant to one of the following standards:

- IEC 61030 [12] (D2B).
- EN50157-1 [17], control protocol through contact 10.
- relevant transmission media of Home Systems (coax and twisted pair).

4.9 Interface for detachable Conditional Access (CA) module

A Conditional Access (CA) system may be needed to provide access to a broadcast service. One solution for a CA system is a detachable module based on a standardized interface between a module and a host equipment as fully specified in EN 50221 [18]. The physical characteristics of this interface, which uses the PCMCIA specification, are described in Annex A of EN 50221 [18].

4.10 Connectors

The following table provides a list of connectors, pin assignments and signals which are relevant to this standard.

Table 1: Survey of connectors and pin assignments, used in this standard

Connector type and Standard	Pin assignment		Connector application / Interface standard
	Pin no.	Signal	
F-type IEC 60169-24	--	1st IF from roof top unit	none
RF type IEC 60169-2	--	VHF/UHF from Yagi or CATV	IEC 60574-3
4 pin Y/C IEC 61076-4-105	3(1) 4(2)	Y signal C signal	IEC 60933-5
Peritelevision IEC 60807-9	1,2,3,6 (4)	audio	IEC 60933-1 EN 50049-1 and Amendments EN 50157-1
	15(13), 11(9), 7(5)	R/C,G,B/C in/out	
	16 (..)	fast blanking	
	19(17)	CVBS/Y out	
	20(18)	CVBS/Y in	
	8	function switch	
	10(21)	control signal line (EN50157-1 only)	
	12	reserved	
phono (see note 2)	--	digital audio	IEC 60958
phono	--	analogue audio	IEC 60268-11 IEC 60574-3
D2B (see note 3)		D2B	IEC 61030
9 pin D-type (see note 4)	1 2 3 4 5 6 7 8 9	DCD Carrier Detect RXD Receive Data TXD Transmit Data DTR Data Terminal Ready GND Signal Ground DSR Data Set Ready RTS Request To Send CTS Clear To Send RI Ring Indicator	
PCMCIA	see PCMCIA documentation		
IEEE 1394	2 TP (data and timing) power (optional)		IEEE 1394
25 pin D-type			IEEE 1284

NOTE 1: Pin numbers between brackets indicate signal return connections.
NOTE 2: A detailed component specification of the "Phono" connector does not exist.
NOTE 3: A detailed component specification of the D2B connector does not exist.
NOTE 4: This standard specifies three applications of this connector, each with its own subset of the signals.

Annex A (informative): Configuration examples

The following diagrams provide examples of DVB-IRD products, featuring the interfaces as specified in this standard. Each version, featuring a certain sub set of the interfaces specified in this standard, can be seen as being specific for a certain market segment. It is left to individual manufacturers to select a certain combination of interfaces in order to reach a certain market segment.

Figure A.1 is a generic diagram showing all interface options. Figures A.2, A.3 and A.4 illustrate the configuration of first generation DVB-IRD devices employing analog interfaces, whereas figure A.5, A.6 and A.7 illustrate configurations based on digital interfaces.

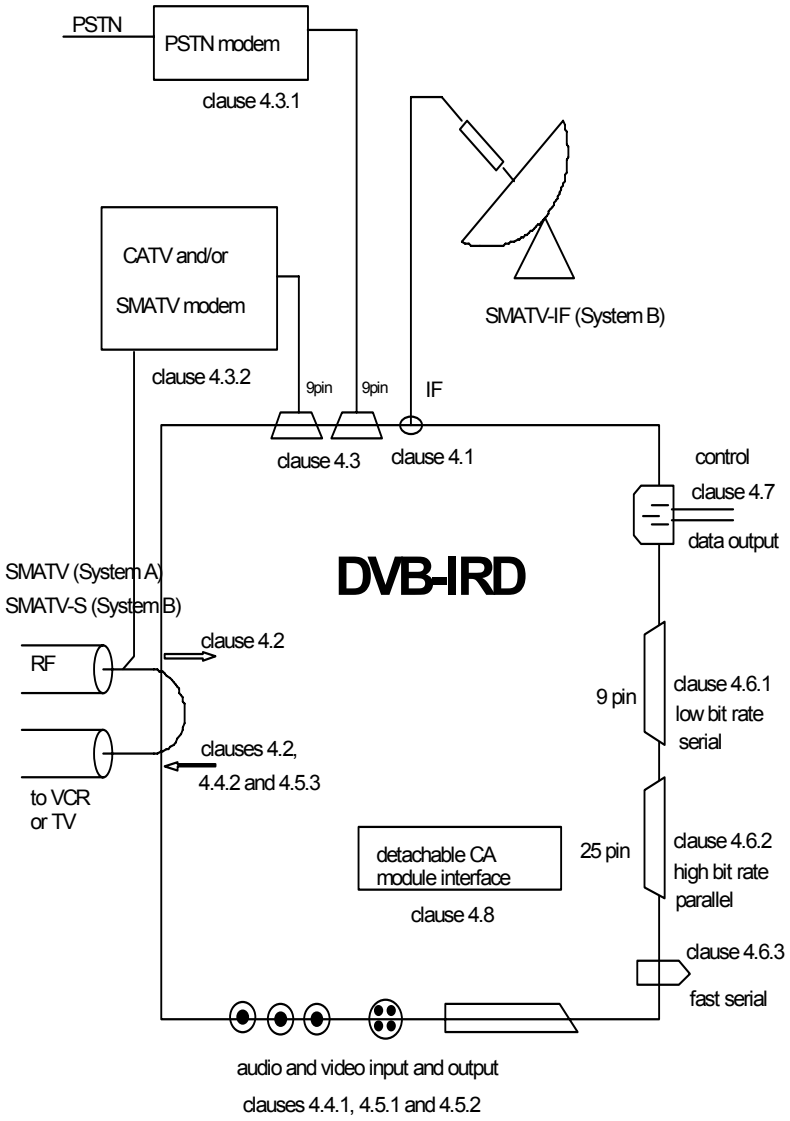


Figure A.1: Generic diagram, showing all optional interfaces

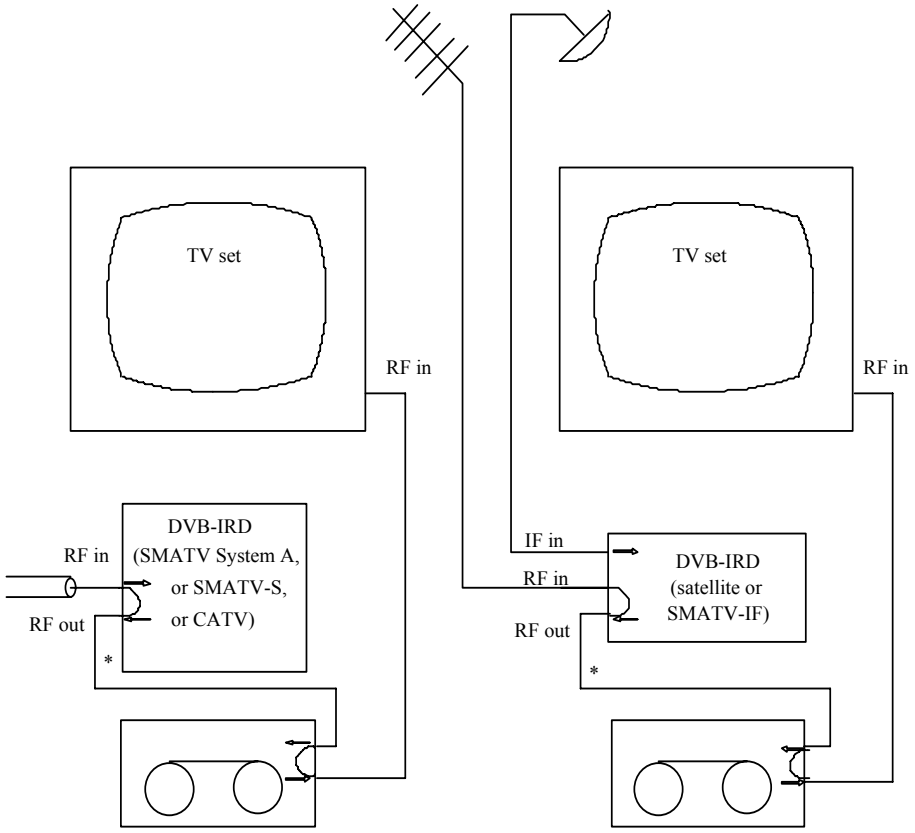


Fig A2a: DVB-IRD for CATV or SMATV System A / SMATV-S reception

Fig A2b: DVB-IRD for satellite or SMATV-IF reception

* DVB-IRD output towards TV-set is on a RF modulated channel

* satellite receiver must also support RF loop through

Figure A.2: Typical low end configuration

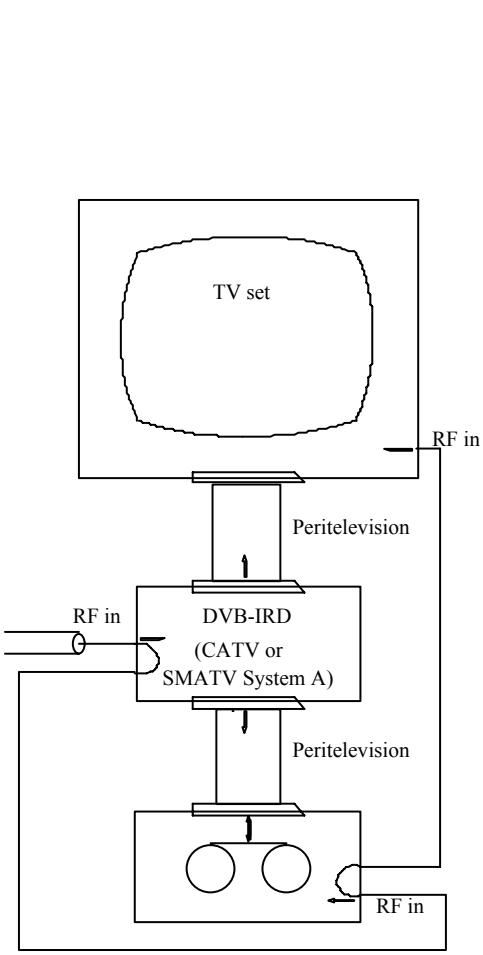


Fig A3a: DVB-IRD for CATV or SMATV System A reception

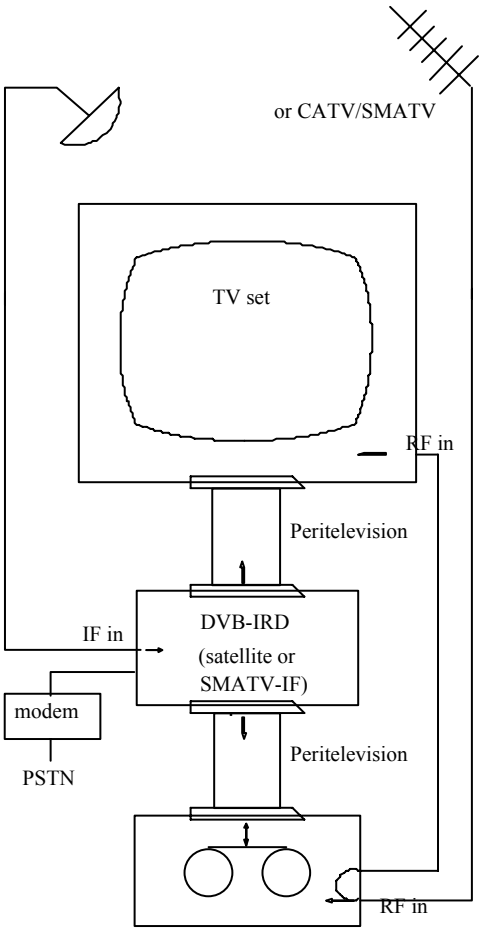


Fig A3b: DVB-IRD for satellite or SMATV-IF reception

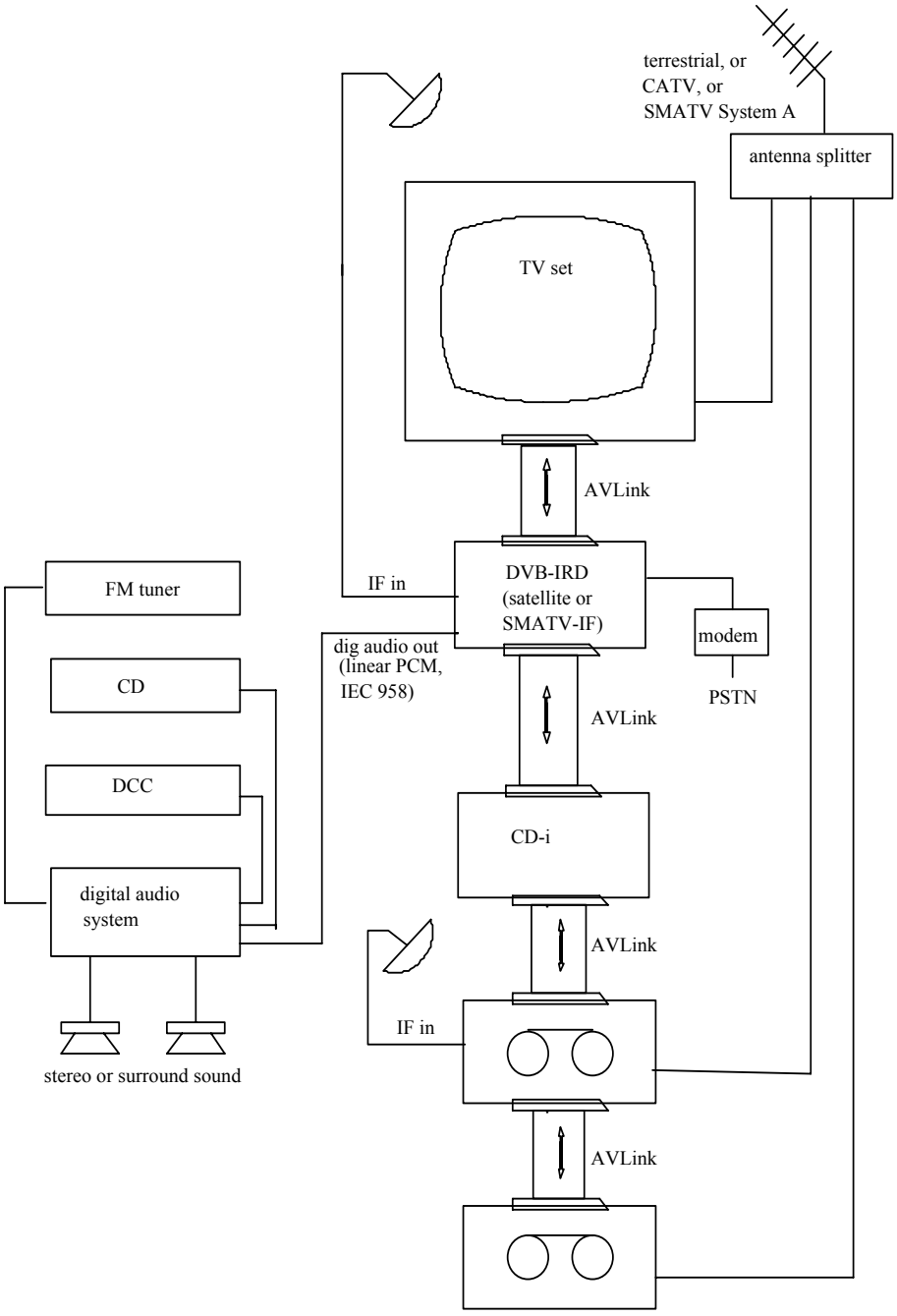
* Peritelevision connections in accordance to EN 50049-1

* DVB-IRD must provide Peritelevision loop through for recorder to TV set

* control of Peritelevision connections through function switch on contact 8

* DVB-IRD (cable) must provide vhf/uhf antenna loop through

Figure A.3: Typical "mid range" configuration



* AVLink connections in accordance with prEN 50157-1
* control of AVLink connections through control signal line on contact 10

Figure A.4: Possible high end configuration

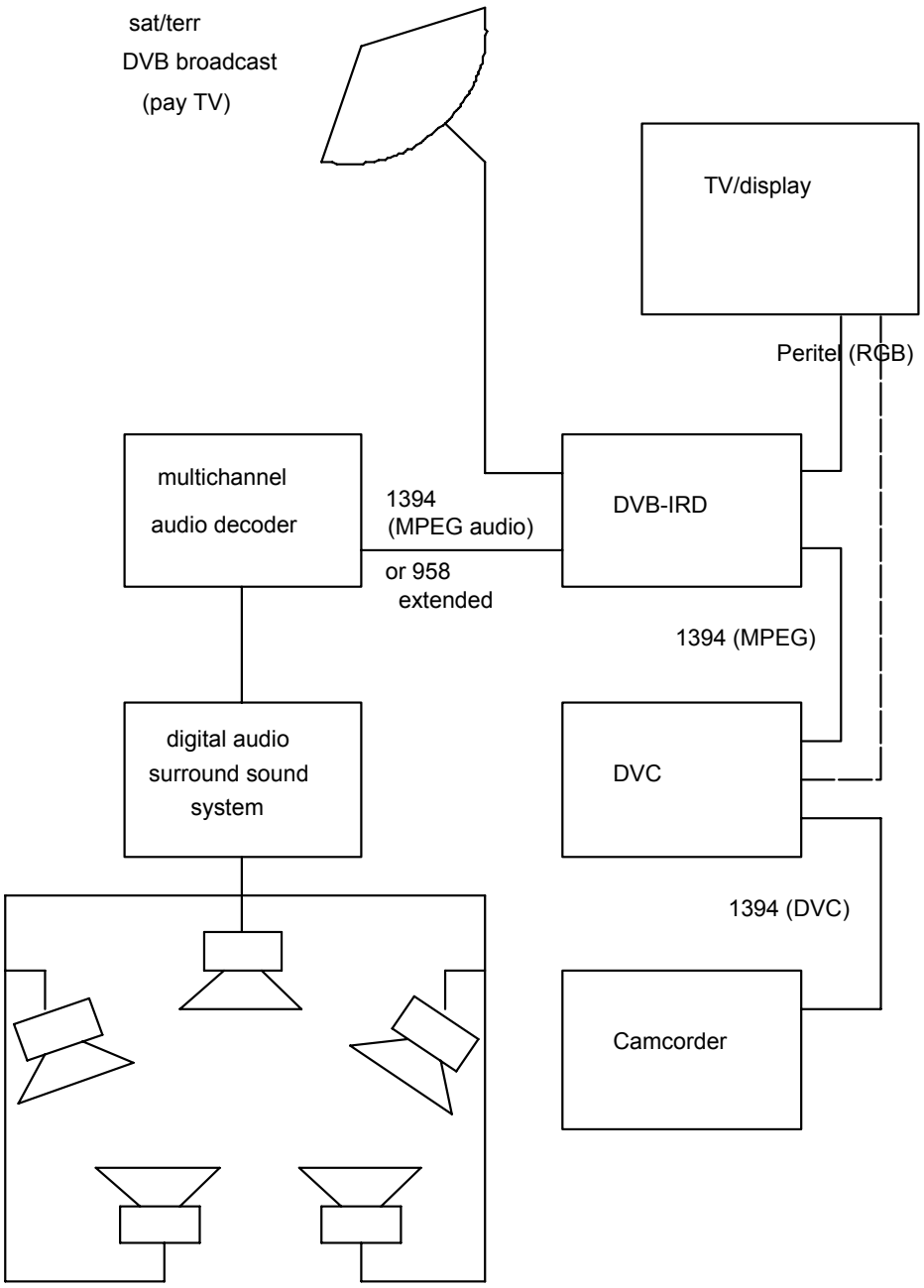


Figure A.5: Example of DVB-IRD broadcast configuration with high speed serial interface

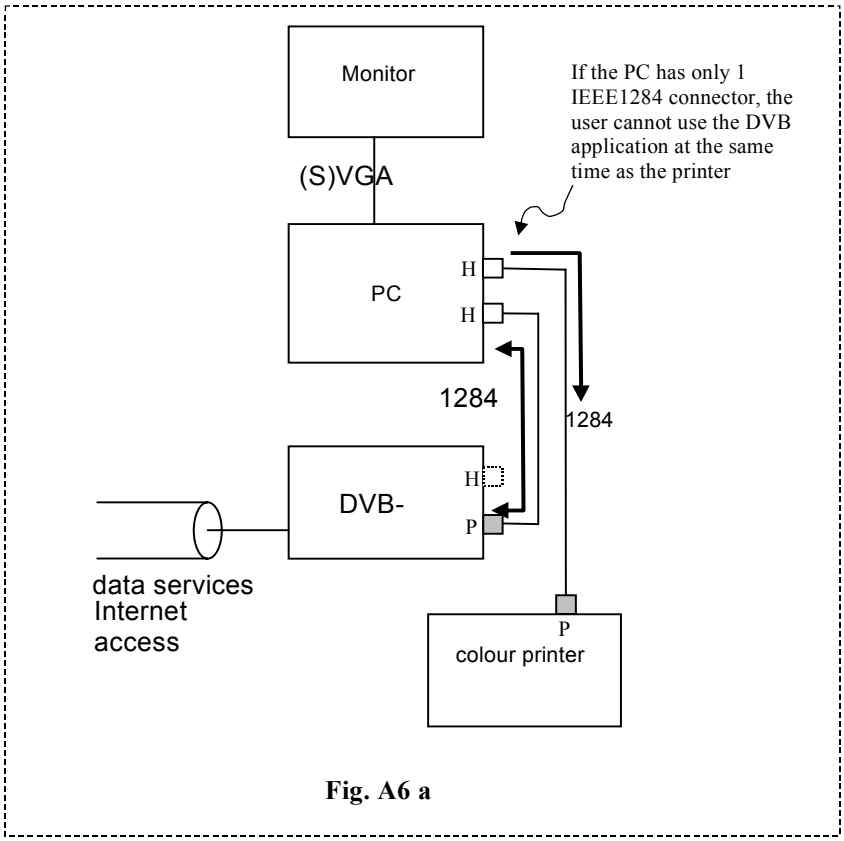


Fig. A6 a

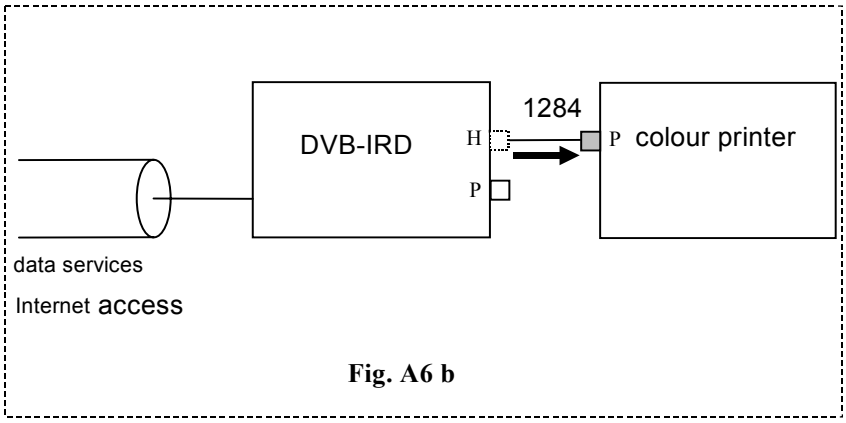


Fig. A6 b

Figure A.6a: Example of DVB-IRD data services application with high speed parallel interface, employing existing installed base of PC and peripheral equipment (printer) (in this figure the IRD only needs to act as a Peripheral)

Figure A.6b: Example of DVB-IRD data services application with high speed parallel interface, directly connected to a printer (in this figure the IRD needs to act as a Host)

This possibility is optional. For the configuration of Figure A.6a is sufficient since the intervening PC may act as the Host towards the printer device. Unlike the figures suggest, one single D-type female 25 pin connector may be used at the IRD side for both A.6a and A.6b. See details in subclause 4.6.2.5.

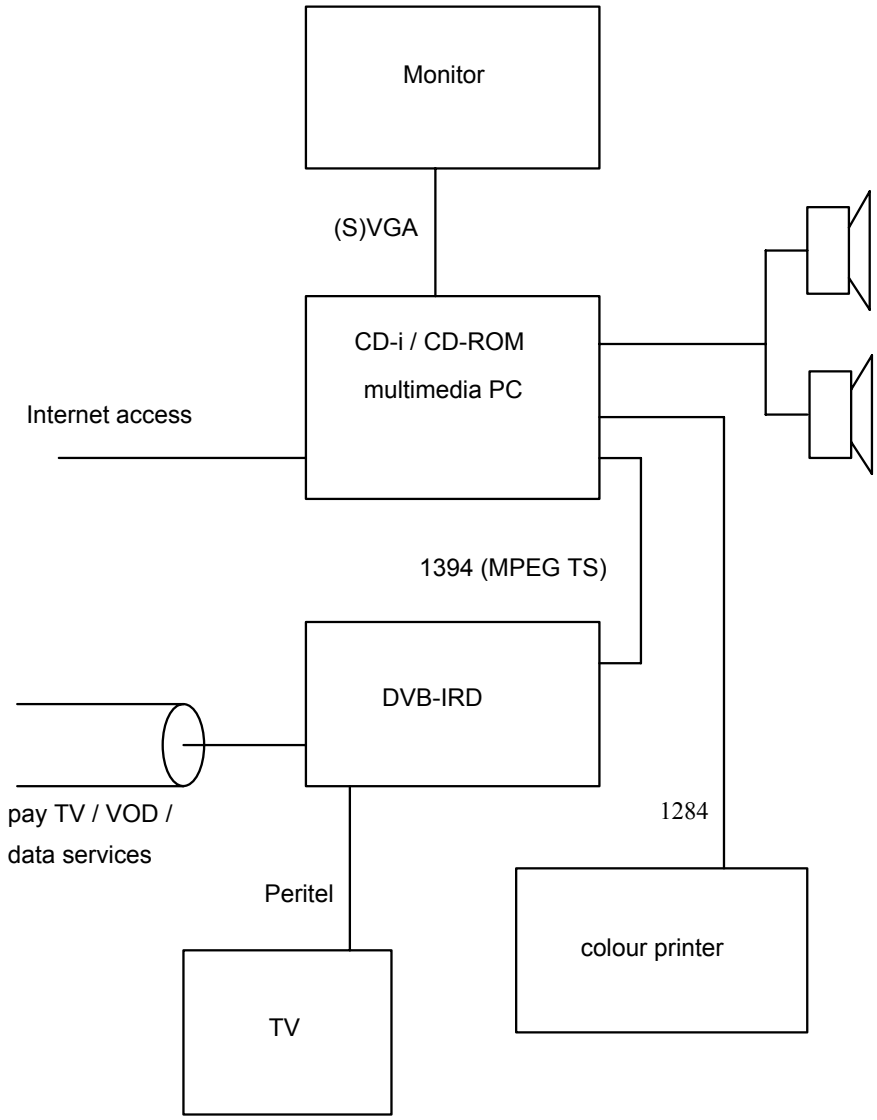


Figure A.7: Example of multimedia DVB-IRD application with high speed serial interface

Annex B (informative): National differences on channel assignments in CATV installations

The following tables provide a survey of national differences regarding channel assignments on CATV installations.

Table B.1: Standards for European countries

Country	VHF	UHF	Colour
Austria	B	G	PAL
Belgium	B	G	PAL
Bulgaria	D	K	SECAM
Bosnia	B	G	PAL
Cyprus	B	G	SECAM
Denmark	B	G	PAL
Finland	B	G	PAL
France	L	L	SECAM
Germany	B	G	PAL
Gibraltar	B	G	PAL
Greece	B	G	SECAM
Hungary	D	K	SECAM
Ireland	I	I	PAL
Iceland	B	G	PAL
Italy	B	G	PAL
Luxembourg	B	G	PAL
Malta	B	-	PAL
Netherlands	B	G	PAL
Norway	B	G	PAL
Poland	D	K	SECAM
Portugal	B	G	PAL
Rumania	D	K	PAL
Russia	D	K	SECAM
Slovenia	D	K	SECAM
Slovakia	D	K	SECAM
Spain	B	G	PAL
Sweden	B	G	PAL
Swiss	B	G	PAL
UK	-	I	PAL
NOTE: Malta is the only exception possibly requiring a special modulator with VHF output channels.			

Table B.2: UHF Channels for standards G, I, K, L (CCIR-Norm, 8 MHz)

Band	Channel	Channel limits (MHz)	Video carrier (MHz)	Audio carrier (MHz)		
				G	I	K,L
IV	21	470...478	471,25	476,75	477,25	477,75
	22	478...486	479,25	484,75	485,25	485,75
	...	8 MHz...	+ 8 MHz	+ 8 MHz	+ 8 MHz	+ 8 MHz
	...	etc.	etc.	etc.	etc.	etc.
	37	598...606	599,25	604,75	605,25	605,75
V	38	606...614	607,25	612,75	613,25	613,75
	...	8 MHz...	+ 8 MHz	+ 8 MHz	+ 8 MHz	+ 8 MHz
	...	etc.	etc.	etc.	etc.	etc.
	69	854...862	855,25	860,75	861,25	861,75
	70	Not used				
	etc.					

Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

IEC 60870-5: "Telecontrol Equipment and Systems, Part 5: Transmission protocols".

IEC 61602: "Connectors used in the field of audio, video and audiovisual engineering".

EN50090: "Home and Building Electronic Systems".

EN 300 421: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services".

EN 300 429: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for cable systems".

ETR 154: Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications

Document History

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