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SERIES J: TRANSMISSION OF TELEVISION, SOUND
PROGRAMME AND OTHER MULTIMEDIA SIGNALS

Digital television distribution through local subscriber
networks

RF remodulator interface for digital television

ITU-T Recommendation J.151

(Formerly CCITT Recommendation)

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For further details, please refer to the list of ITU-T Recommendations.

RF remodulator interface for digital television

Summary

With the advent of digital television (DTV) there is now a need for a simple and cost-effective interconnect between the various digital signal sources and the DTV receiver. Digital video and audio are now available from digital VCRs (DVCR), terrestrial broadcasts, digital video disks (DVD), cable TV, satellite systems and digital camcorders. The RF remodulator in this Recommendation is an economical and practical digital interconnect for the new consumer digital video devices. The RF remodulator, is a one way throughput device with a data rate of 19.3 Mbit/s, which is suitable for most connections. The interface transmits MPEG (Moving Picture Experts Group) data for compressed digital video and audio and an OSD (on-screen display) overlay. The RF remodulator uses a simple coaxial cable to interconnect devices in a way with which consumers are most familiar.

Source

ITU-T Recommendation J.151 was prepared by ITU-T Study Group 9 (1997-2000) and approved by the World Telecommunication Standardization Assembly (Montreal, 27 September – 6 October 2000).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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RF remodulator interface for digital television

1 Scope

This ITU-T Recommendation defines an RF remodulator interface for digital television with an advanced on-screen display (OSD) overlay capability. This Recommendation defines minimum specifications for a one-way data path utilizing an 8 VSB trellis (8T VSB) or a 16 VSB remodulator in compliance with Annex D/J.83 (System D) (ATSC Standard A/53, Annex D). The advanced overlay uses the same OSD syntax as ITU-T J.117 and allows signal service providers their incremental revenue from programme guides and supplemental services. The RF remodulator also facilitates conditional access required by service providers.

This Recommendation applies to any type of device used to connect to a J.83 System D compliant digital television receiver. Devices meeting this Recommendation should interoperate with any J.83 System D compliant receiver that also supports "monitor mode."

This Recommendation addresses RF output specifications, on-screen display (OSD) capabilities, and capability profiles for a DTV remodulator and recommendations concerning input to the remodulator.

This Recommendation is derived from several standards of the Electronic Industries Alliance (EIA).

2 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is published regularly.

- ITU-R BT.601-5 (1995), *Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspect ratios*.
- ITU-R BT.709-4 (2000), *Parameter values for the HDTV standards for production and international programme exchange*.
- ITU-T J.83 (1997), *Digital multi-programme systems for television, sound and data services for cable distribution, Annex D*.
- IEC 60169-24 (1991), *Radio-frequency connectors – Part 24: Radio-frequency coaxial connectors with screw coupling, typically for use in 75 ohm cable distribution systems (Type F)*.

3 Abbreviations

This Recommendation uses the following abbreviations:

ATSC Advanced Television Systems Committee

A/V Audio/Video

CEA Consumer Electronics Association

CLUT	Colour Look-Up Table
CPU	Central Processing Unit
CVCT	Cable Virtual Channel Table
D/A	Digital-to-Analogue
DTV	Digital Television: ATSC compliant receiving device
DVCR	Digital Video Cassette Recorder
DVD	Digital Video Disk
EIA	Electronic Industries Alliance
EIT	Event Information Table
EVM	Error Vector Magnitude
HDTV	High Definition TeleVision
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
IRC	Interface Reference Clock
ITU	International Telecommunication Union
MPEG	Moving Picture Experts Group
NTSC	National Television Systems Committee
OSD	On-Screen Display
PAT	Program Association Table
PES	Program Elementary Stream
PID	Program Identifier
PMT	Program Map Table
PSIP	Program and System Information Protocol
RF	Radio Frequency
SDTV	Standard Definition Television
STB	Set-Top Box
TSID	Transport Stream Identification
TVCT	Terrestrial Virtual Channel Table
UHF	Ultra High Frequency
VCR	Video Cassette Recorder
VCT	Virtual Channel Table
VHF	Very High Frequency
VSF	Vestigial SideBand

4 System overview

A typical NTSC analogue system with an RF remodulator appears in Figure 1. The figure shows a typical VCR block diagram but could be a cable set top box (STB) or satellite receiver. The consumer connects the RF signal from the antenna or cable feed to the VCR or STB. The VCR or other receiving device connects to the television receiver via the RF output jack. If the VCR or receiving device is not in use, it simply passes the entire RF spectrum through to the TV. If the VCR or receiving device is active in the play mode, it remodulates the video and audio signals to an unused RF channel for display by the television set. The VCR, STB or satellite receiver can overlay its own on-screen display for user control or added features. The connection is made with an inexpensive coaxial cable.

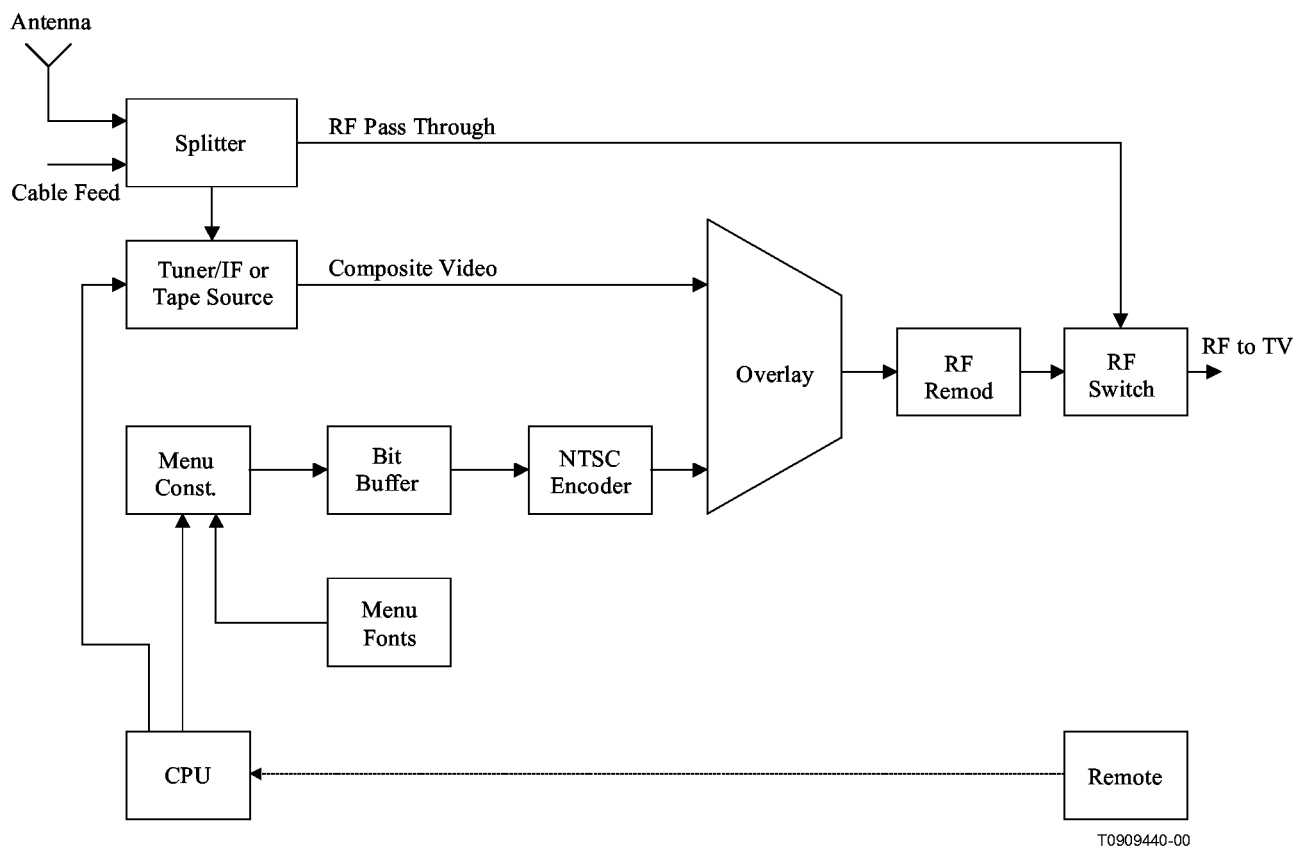


Figure 1/J.151 – Typical NTSC system

The system of Figure 1 can be extended to the digital receiving device and digital TV receiver (DTV) by using the RF Remodulator as depicted in Figure 2. This Recommendation defines a specification for an RF digital interface to a DTV receiver that provides a level of functionality that is similar to the analogue system. This solution is very practical, cost-effective, and introduces no picture or sound degradation. The RF Remodulator has the added advantage of no cable length limitation as do some baseband digital interfaces such as the type in ITU-T J.117.

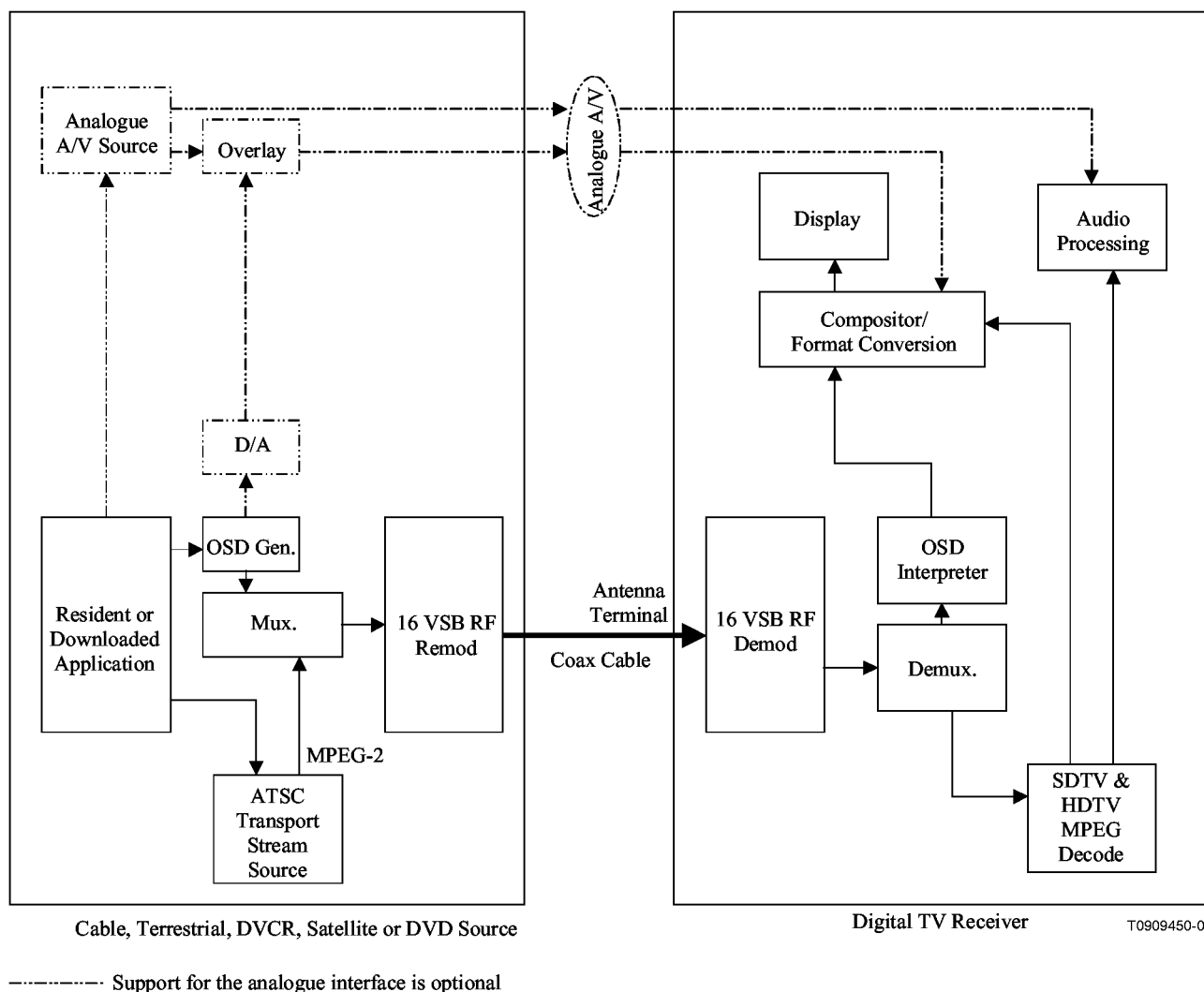


Figure 2/J.151 – Equivalent DTV system

Figure 2 depicts a digital audio/video receiving device connected to a DTV receiver with a 75-ohm coaxial cable. The figure also shows an optional analogue baseband connection. The OSD data is multiplexed with the source material before the remodulator. This allows for extended features like on-screen programming guides or on-screen display capability for operating the VCR, STB or other signal-receiving device. If no OSD information is required, this system can deliver two HD signals to the DTV receiver using the 16VSB mode.

Users of this Recommendation should note that future copy protection systems or standards will be implemented and content traversing this DTV RF interface will be required to comply with these future systems or standards.