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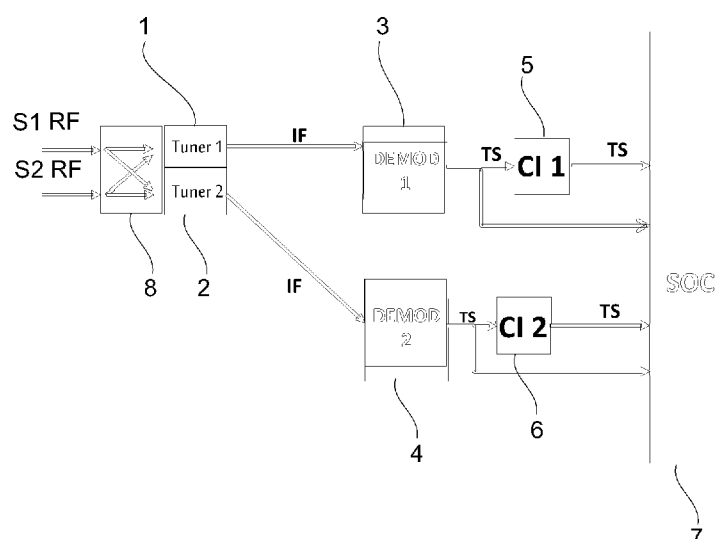
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(54) Title: SYSTEM FOR MULTIPLE-COMMON INTERFACE MANAGEMENT CONFIGURATION IN AN IMAGE DISPLAY DEVICE

Fig. 2



(57) Abstract: The present invention relates to an image display device for processing at least a first program content and/or at least a second program content, comprising at least a first common interface (5) and at least a second common interface (6) for receiving a first conditional access module and/or a second conditional access module, said program contents being respectively selected from at least a first transport stream and a second transport stream, said image display device further comprising a first tuner (1) in signal communication with a first demodulator (3) to process the first transport stream and a second tuner (2) in signal communication with a second demodulator (4) to process the second transport stream.



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Description**SYSTEM FOR MULTIPLE-COMMON INTERFACE MANAGEMENT
CONFIGURATION IN AN IMAGE DISPLAY DEVICE**

- [0001] The present invention relates to a system for multiple-common interface management in an image display device
- [0002] Considering the fact that a large number of television and multimedia services are being made available to consumers today, methods for enabling the host, i.e. an image display device such as a TV set with a digital receiver-decoder to satisfactorily process the received services are required. An image display device may receive programs via cable or satellite broadcasting in the form of separate subscription formats.
- [0003] A conditional access module (CAM) connected to the host device serves to the purpose of decrypting the received programs. The common interface (CI) typically provides that the conditional access process is managed by the conditional access module (CAM) instead of the host device.
- [0004] A conventional structure receiving conditional access content may receive a transport stream via a tuner, the content being rendered such that the transport stream is sent to the conditional access module to be decrypted. The de-multiplexer determines appropriate tracks according to the selected program of the transport stream. The received conditional access content can therefore be displayed or recorded.
- [0005] It is to be noted that in order for viewing a first decrypted program content and recording a second decrypted program content, the receiver-decoder should have two tuners, which also enables various types of services including interactive functions such as picture-in-picture. In this case, the two transport streams may be multiplexed and sent to the CAM. The CAM descrambles the program contents selected respectively for viewing and recording and returns the multiplexed transport streams to the host device.
- [0006] Among others, a prior art publication in the technical field of the invention may be referred to as US2003123657, which discloses methods and apparatus for simultaneously decrypting multiple services received on separate encrypted multiplexed transport streams. A plurality of encrypted

multiplexed transport streams may be received at a television terminal. Each transport stream may have at least one service. The plurality of multiplexed transport streams may be received by, for example, multiple tuning devices and/or provided from a storage device, such as a Personal Versatile Recorder (PVR). A plurality of desired services is selected from a subset of the transport streams. The desired services are multiplexed into a desired service multiplex and decrypted by a single decryption engine to provide a desired decrypted multiplex. The desired decrypted multiplex is then de-multiplexed so that the desired services can be decoded and provided to a user.

- [0007] It is therefore known that conventional methods use transport stream multiplexing for management of CI modules. Due to the fact that each transport stream needs to be directed using an interface with 11 I/O pins, the PCB layout becomes overly complicated and costly due to the necessity to use a plurality of multiplexer circuits.
- [0008] The present invention, on the other hand, provides a substantially cost-effective system for processing separate conditional access contents in an image display device, as provided by the characterizing features defined in Claim 1.
- [0009] Primary object of the present invention is to therefore provide a system by which separate conditional access contents are processed without making use of 11 bit multiplexing integrated circuits in the image display device.
- [0010] The present invention proposes an image display device, i.e. a TV set with at least two common interfaces receiving separate conditional access modules. The image display device further comprises at least two tuners in communication with respective demodulators to process at least a first and second transport streams.
- [0011] The first and second transport streams are selectively processable by transferring the same to the first or second tuners through an RF cross switch which serves to the purpose of determining which tuner and demodulator pair is to be used based on an activated common interface through a respective conditional access module(s).
- [0012] Accompanying drawings are given solely for the purpose of exemplifying a

system with a multiple-common interface management configuration allowing processing of separate conditional access contents, whose advantages over prior art were outlined above and will be explained in brief hereinafter.

[0013] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in said claims without recourse to the technical disclosure in the description of the present invention.

[0014] Fig. 1 demonstrates a general schematic block diagram representation of a conventional multiple-common interface management configuration.

[0015] Fig. 2 demonstrates a general schematic block diagram representation of the system according to the present invention.

[0016] The following numerals are referred to in the description of the present invention:

1. First tuner
2. Second tuner
3. First demodulator
4. Second demodulator
5. First common interface
6. Second common interface
7. System on Chip
8. Cross switch

[0017] The present invention proposes a system for processing at least a first program content and at least a second program content, said program contents being respectively selected from at least a first transport stream and at least a second transport stream, the method for processing at least a first program content and at least a second program content being applicable by an image display device in communication with a first conditional access module inserted in a first common interface (5) and a second conditional access module inserted in a second common interface (6) thereof, said image display device further having a first tuner (1) to receive the first transport stream and a second tuner (2) to receive the second transport stream, each of the transport streams conventionally

comprising multiple programs per transport stream.

- [0018] The image display device of the invention has multiple tuner/demodulators (1, 2, 3 and 4) suitable for receiving broadcast multimedia content. In the case of satellite signals, the tuners (1, 2) are typically connected to dish antennas collecting satellite signals to be focused by the parabolic curvature thereof. Conventionally, signal received from a satellite dish is amplified by a low noise amplifier (LNA) and converted to IF signal (Intermediate frequency) in the form of a block of frequencies by a block converter (the LNB, low noise block downconverter), which can then be processed by the demodulators (3, 4).
- [0019] The demodulators (3, 4) typically output transport streams to the respective audio/video processing unit, which accordingly processes said transport streams and retrieves service data for all the channels. As is known to the skilled reader, the intermediate frequency is typically created by mixing the carrier signal with a local oscillator signal by heterodyning, which allows the signals in microwave frequencies to be sent over a length of cable. The output of the mixer is an IF signal of a specific bandwidth that can be amplified.
- [0020] In reference to Fig. 1, transport stream multiplexer (TS MUX) is shown in communication with respective CI (Common Interface) modules. Due to the fact that each transport stream interface has 11 I/O pins, multiplexer (TS MUX) cost is overly high and the PCB layout is complex. It is to be noted that in the case of more than two CI modules and antenna (RF) input, the configuration of Fig. 1 is not applicable.
- [0021] According to the present invention, an RF cross switch (8) is used to switch on the RF signal depending on the first or second common interface (5, 6) to be used. Therefore, a respective terrestrial, satellite or cable tuner/demodulator pair to be used is determined based on the selected common interface (5, 6) module. The present invention therefore eliminates the need for using a combinational logical circuit in the form of a multiplexer. The present embodiment with an RF cross switch (8) can be also used in case more than two common interfaces (5, 6) are in question.
- [0022] Fig. 2 corresponds to an exemplary situation where two satellite sources

are connected to the RF cross-switch (8). In the event that the broadcast is received from the first input (S1), either the first tuner (1) or the second tuner (2) can be in use depending into which common interface (5, 6) slot a respective conditional access module is inserted. The first or the second inputs (S1, S2) can be used in connection with both said first or second common interfaces (5, 6).

[0023] Therefore, a first program content in the form of encrypted conditional access content received by the first tuner (1) through said RF cross switch (8) is sent to the first conditional access module to be decrypted. Likewise, a second program content in the form of encrypted conditional access content received by the second tuner (2) also through said RF cross switch (8) is sent to the second conditional access module to be decrypted.

[0024] Typically, the processing unit receiving the first transport stream and the second transport stream executes the viewing and/or recording operations according to the preference of the users. Systems capable of receiving and tuning to signals of different generations (e.g. DVB-T and DVB-T2, DVB-S and DVB-S2, DVB-C and DVB-C2) may be in use.

[0025] In a nutshell, the present invention proposes an image display device for processing at least a first program content and/or at least a second program content, comprising at least a first common interface (5) and at least a second common interface (6) for receiving a first conditional access module and/or a second conditional access module, said program contents being respectively selected from at least a first transport stream and a second transport stream, said image display device further comprising a first tuner (1) in signal communication with a first demodulator (3) to process the first transport stream and a second tuner (2) in signal communication with a second demodulator (4) to process the second transport stream.

[0026] In one embodiment of the invention, said first and second transport streams are selectively transferred to the first or second tuners (1, 2) through an RF cross switch in the manner that a tuner (1, 2) and demodulator (3, 4) pair is determined based on an activated common

interface (5, 6) through a respective conditional access module.

- [0027] In a further embodiment of the invention, a processing unit of said image display device receiving the first transport stream and the second transport stream executes simultaneous displaying and/or recording operation of one of the first or the second program contents being encrypted conditional access contents.
- [0028] In a yet still further embodiment of the invention, each of said first tuner (1) receiving the first transport stream and said second tuner (2) receiving the second transport stream is either a terrestrial, satellite or cable tuner.
- [0029] In a yet still further embodiment of the invention, each of said first tuner (1) receiving the first transport stream and said second tuner (2) receiving the second transport stream is either a DVB-T, DVB-T2, DVB-S, DVB-S2, DVB-C or DVB-C2 tuner.
- [0030] The invention therefore provides a simple yet very efficient method for managing conditional access contents to be decrypted without making use of conventional overly complicated and expensive multiplexing solutions. The advantageous aspect of the invention therefore lies in that the RF signal is selectively directed before a respective input signal reaches any of the tuners.

Claims

1. An image display device for processing at least a first program content and/or at least a second program content, comprising at least a first common interface (5) and at least a second common interface (6) for receiving a first conditional access module and/or a second conditional access module, said program contents being respectively selected from at least a first transport stream and a second transport stream, said image display device further comprising a first tuner (1) in signal communication with a first demodulator (3) to process the first transport stream and a second tuner (2) in signal communication with a second demodulator (4) to process the second transport stream **characterized in that**;
said first and second transport streams are selectively transferred to the first or second tuners (1, 2) through an RF cross switch in the manner that a specific tuner (1, 2) and demodulator (3, 4) pair is determined based on an activated common interface (5, 6) through a respective conditional access module.
2. An image display device as in Claim 1, **characterized in that** a processing unit of said image display device receiving the first transport stream and the second transport stream executes simultaneous displaying and/or recording operation of one of the first or the second program contents being encrypted conditional access contents.
3. An image display device as in Claim 1 or 2, **characterized in that** each of said first tuner (1) receiving the first transport stream and said second tuner (2) receiving the second transport stream is either a terrestrial, satellite or cable tuner.
4. An image display device as in Claim 3, **characterized in that** each of said first tuner (1) receiving the first transport stream and said second tuner (2) receiving the second transport stream is either a DVB-T, DVB-T2, DVB-S, DVB-S2, DVB-C or DVB-C2 tuner.

Fig. 1

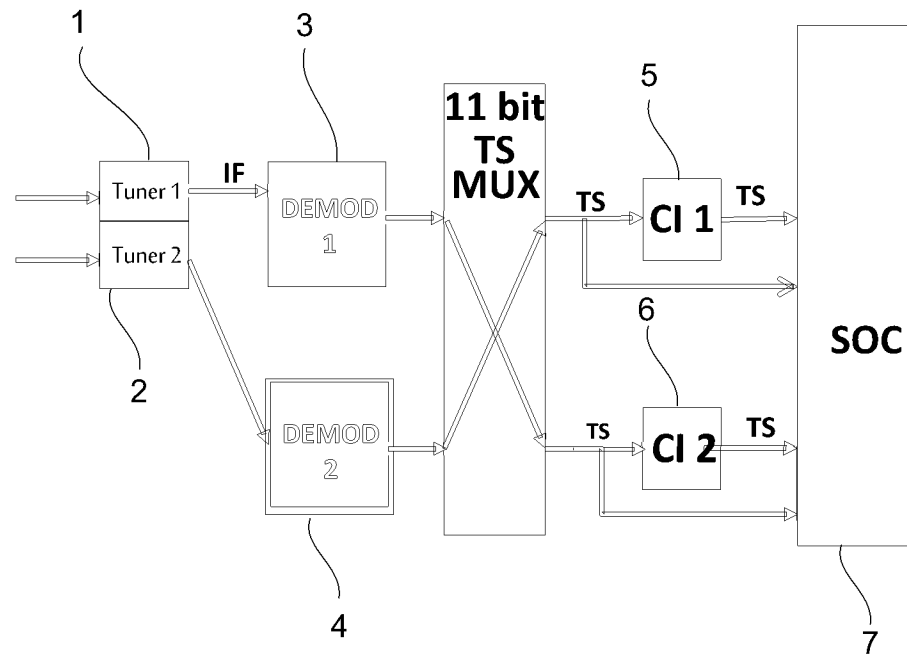
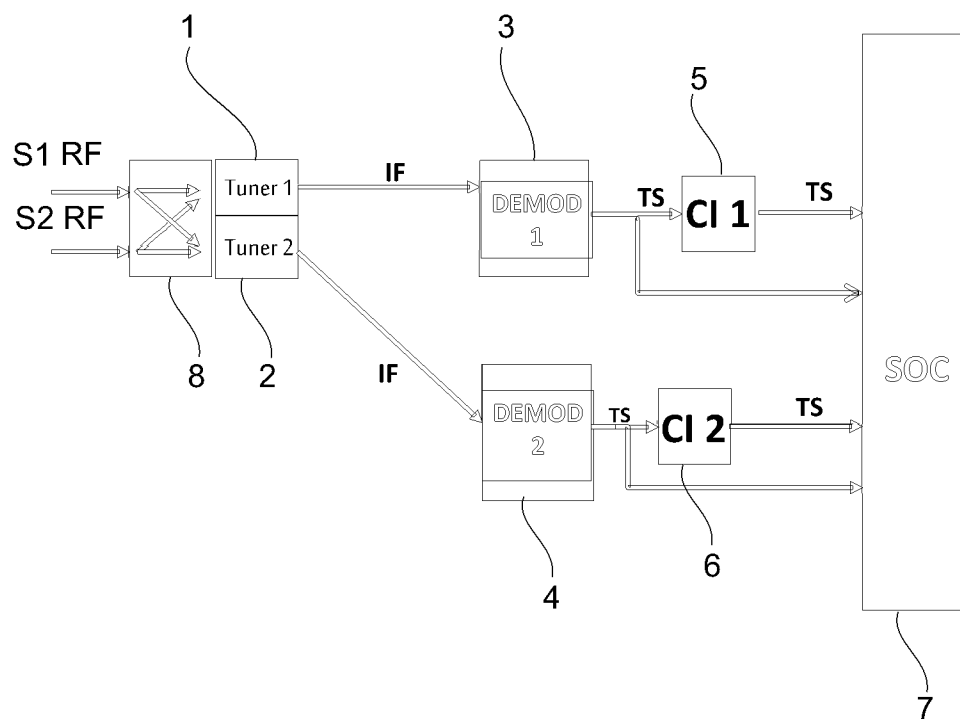


Fig. 2



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N21/436 H04N21/418
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2015/149834 A1 (ARCELIK AS [TR]) 8 October 2015 (2015-10-08) abstract; figures 1-11 paragraphs [0009] - [0012], [0027], [0028]	1-4
Y	----- WO 01/56297 A1 (ATHEROS COMM INC [US]) 2 August 2001 (2001-08-02) abstract; figure 2 page 6, line 26 - page 7, line 3 page 7, lines 21-27	1-4
A	----- US 7 930 712 B1 (JOSEPH KURIACOSE [US] ET AL) 19 April 2011 (2011-04-19) abstract; figures 3,4 -----	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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