

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 December 2001 (27.12.2001)

PCT

(10) International Publication Number
WO 01/99434 A2

- (51) International Patent Classification⁷: **H04N 500/** (74) Agent: **GRAVENDEEL, Cornelis**; Internationaal Octrooibureau B.V., Prof Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (21) International Application Number: PCT/EP01/06635
- (22) International Filing Date: 11 June 2001 (11.06.2001) (81) Designated States (*national*): CN, JP, KR.
- (25) Filing Language: English (84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).
- (26) Publication Language: English
- (30) Priority Data: 09/596,216 19 June 2000 (19.06.2000) US
Published:
— *without international search report and to be republished upon receipt of that report*
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
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(54) Title: APPLICATION-SPECIFIC POINT OF DEPLOYMENT MODULES FOR USE IN DIGITAL CABLE COMPLIANT DEVICES

(57) Abstract: There is disclosed, for use in a digital cable set top box coupled to a television set, a removable circuit apparatus capable of being inserted into a point of deployment (POD) host interface associated with the digital cable set top box, the removable circuit apparatus comprising: 1) a point of deployment (POD) module interface capable of mating with the POD host interface; 2) a data processor coupled to the POD module interface and capable of transmitting to the digital cable set top box at least one of an audio signal and a video signal capable of being displayed on a screen of the television set; and 3) a memory coupled to the data processor capable of storing a user POD application program executable by the data processor.

Application-specific point of deployment modules for use in digital cable compliant devices

TECHNICAL FIELD OF THE INVENTION

The present invention is directed, in general, to digital cable compliant devices and, more specifically, to a point of deployment (POD) module for use in a digital cable set top box.

5

BACKGROUND OF THE INVENTION

Modern electronic technology has made a wide array of communication, multimedia and information processing systems available to consumers and business. Most people are familiar with and use personal computers, television sets, AM/FM stereo
10 receivers, video cassette recorders (VCR), digital video discs (DVD) players, video game consoles and the like. These electronic appliances are used for business purposes and for personal entertainment purposes.

Many of the functions in some of these electronic appliances are redundant to similar functions in other electronic appliances. For example, a person may view video
15 content on a television set and on a personal computer (PC) monitor and can listen to audio on television, on stereos, on MP3 players, on cassette tape players, and the like. Similarly, a person can play a video game on the screen of a PC monitor or on the screen of a television connected to a video game control module (or play station). It would be preferable if these redundant functions could be reduced in order to reduce a consumer's overall equipment
20 costs.

Therefore, there is a need in the art for electronic systems that are capable of converging redundant functions performed by a variety of consumer devices. In particular, there is a need for electronic apparatuses that may be used in conjunction with conventional consumer devices to enhance the capabilities of those consumer devices. More particularly,
25 there is a need for electronic apparatuses that may be inserted into or attached to a standard consumer electronic system to thereby enable the standard consumer electronic system to perform enhanced, non-standard applications.

SUMMARY OF THE INVENTION

To address the above-discussed deficiencies of the prior art, it is a primary object of the present invention to provide for use in a digital cable set top box coupled to a television set, a removable circuit apparatus capable of being inserted into a point of
5 deployment (POD) host interface associated with the digital cable set top box, the removable circuit apparatus comprising: 1) a point of deployment (POD) module interface capable of mating with the POD host interface; 2) a data processor coupled to the POD module interface and capable of transmitting to the digital cable set top box at least one of an audio signal and a video signal capable of being displayed on a screen of the television set; and 3) a memory
10 coupled to the data processor capable of storing a user POD application program executable by the data processor.

In one embodiment of the present invention, the data processor is capable of receiving user input signals from the digital cable set top box.

In another embodiment of the present invention, the user input signals
15 comprise infrared signals detected by an infrared sensor associated with the digital cable set top box.

In still another embodiment of the present invention, the removable circuit apparatus further comprises a user interface coupled to the data processor capable of receiving user inputs from a user input device coupled to the user interface.

20 In yet another embodiment of the present invention, the user input device comprises a keyboard.

In a further embodiment of the present invention, the user input device comprises a mouse.

In a still further embodiment of the present invention, the removable circuit
25 apparatus further comprises a disk storage device capable of storing the user POD application program.

According to another embodiment of the present invention, the removable circuit apparatus further comprises a disk storage device capable of storing one or more of audio files, video files, graphics files, and text files associated with the user POD application
30 program.

According to still another embodiment of the present invention, the user POD application program comprises a video game program.

According to yet another embodiment of the present invention, the user POD application program comprises an e-mail program.

The foregoing has outlined rather broadly the features and technical advantages of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features and advantages of the invention will be described hereinafter that form the subject of the claims of the invention.

5 Those skilled in the art should appreciate that they may readily use the conception and the specific embodiment disclosed as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

10 Before undertaking the DETAILED DESCRIPTION OF THE INVENTION, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms "include" and "comprise" and derivatives thereof mean inclusion without limitation; the term "or" is inclusive, meaning and/or; the phrases "associated with" and "associated therewith" and derivatives thereof, may mean to include,
15 be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term "controller" means any device, system or part thereof that controls at least one operation, such a device may be implemented in hardware, firmware or software, or some combination of at least two of the
20 same. It should be noted that the functionality associated with any particular controller may be centralized or distributed, whether locally or remotely. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

25 BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, wherein like numbers designate like objects, and in which:

30 FIGURE 1 illustrates a television set and a digital cable set top box according to one embodiment of the present invention;

FIGURE 2 illustrates a digital cable set top box and a conventional point-of-deployment (POD) module according to one embodiment of the prior art; and

FIGURE 3 illustrates a digital cable set top box and a novel point-of-deployment (POD) module according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIGURES 1 through 3, discussed below, and the various embodiments used to describe the principles of the present invention in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the invention. Those skilled in the art will understand that the principles of the present invention may be implemented in any suitably arranged digital cable compliant appliance.

FIGURE 1 illustrates television set 105 and digital cable set top box 150 according to one embodiment of the present invention. Television set 105 comprises display screen 110 for displaying cable television programming provided by a cable service provider (Cable Co.), infrared (IR) sensor 115, and a set of manual controls 120, as indicated by a surrounding dotted line. Manual controls 120 may include, among others, a power button, a volume control button, vertical and horizontal directional control buttons, a channel selection button, and the like. IR sensor 115 receives infrared (IR) control signals from a hand-held remote control manipulated by the cable subscriber. Typically, the IR control signals detected by IR sensor 115 are processed within television set 105 in order to change the channel being viewed on display screen 110, to increase or to decrease the volume, to turn television set 105 on and off, and the like. Optionally, the IR control signals detected by IR sensor 115 may be relayed to digital cable set top box 150 in order to control the operation of digital cable set top box 150.

In an advantageous embodiment of the present invention, digital cable set top box 150 is a standards-based device that allows a cable subscriber to receive digital cable television service from a cable provider (Cable Co.). Digital cable set top box 150 is a “generic” device that the cable subscriber may purchase from any one of a number of retail vendors, not merely from the cable service provider, thereby reducing the cost of such devices. The impetus for open-standard devices such as digital cable set top box 150 was provided by the FCC’s 1996 Telecom Reform Act, which required the retail availability of cable set top boxes.

Digital cable set top box 150 also comprises removable point-of-deployment (POD) module 155, which is provided by the cable service provider. Digital cable set top box 150 is a “host” device with respect to POD module 155. Digital cable set top box 150 performs conventional tuning and demodulation of incoming RF signals received from the

cable service provider to thereby produce, for example, a stream of MPEG encoded digital data from which video signals may be derived.

POD module 155 typically comprises circuitry capable of performing conditional access and security functions that are proprietary and closely guarded. These functions allow selective access to basic digital cable services, such as network television broadcasts, and to premium digital cable services, such as pay-per-view programming, HBO, SHOWTIME, and the like. Typically, the cable subscriber may obtain POD module 155 only by purchasing or leasing POD module 155 from the cable service provider.

Digital cable set top box 150 also comprises infrared (IR) sensor 160. IR sensor 160 receives infrared (IR) control signals from a hand-held remote control manipulated by the cable subscriber. Preferably, the remote control that controls digital cable set top box 150 is the same remote control that operates television set 105. Typically, the IR control signals detected by IR sensor 160 are processed within digital cable set top box 150 in order to change the channel being transmitted to television set 105 for viewing on display screen 110, to turn digital cable set top box 150 and/or television set 105 on and off, and the like.

In some embodiments of the present invention, digital cable set top box 150 may actually be integrated into television set 105. This may be particularly true in the case of advanced digital television sets, such as high-definition television (HDTV) sets. Since the functions and operations of digital cable set top box 150 are open and well-known, television manufacturers frequently may find it advantageous to integrate digital cable set top box 150 into television set 150, thereby reducing the amount of equipment, wiring, and set-up work required of the cable subscriber. In such embodiments, television set 105 may include an externally accessible card slot into which removable POD module 155 may be inserted.

Additionally, in some embodiments of the present invention, digital cable set top box 150 may optionally include a telephone interface circuitry (e.g., a modem) that allows digital cable set top box 150 to be coupled to the public switched telephone network (PSTN). In such embodiments, digital cable set top box 150 may send and receive commands and data that are required in order for digital cable set top box 150 and/or POD module 155 to operate properly. In one embodiment, the cable service provider transmits the required commands and data to digital cable set top box 150 by dialing the cable subscriber's telephone number and downloading the commands and data to digital cable set top box 150.

Devices such as POD module 155 and digital cable set top box 150 are described in the literature of the cable services industry and related engineering standards

committees. One such document is "Proposed HOST-POD Interface Specification", SCTE DVS/295, dated January 7, 2000 and provided by the Society of Cable Telecommunications Engineers, Inc. The subject matter disclosed in Document No. SCTE DVS/2956 are hereby incorporated by reference into the present disclosure as if fully set forth herein.

5 FIGURE 2 illustrates digital cable set top box 150 and conventional point-of-deployment (POD) module 155 according to one embodiment of the prior art. Digital cable set top box 150 comprises host interface 200 which mates with conventional POD module 155. Host interface 200 comprises tuner 205, demodulation (DEMOD) circuitry 210, quadrature phase shift keying (QPSK) transmitter (TX) 215, and digital data receiver
10 (RX) 220. Host interface 200 further comprises demultiplexer (DEMUX) 225, MPEG video processing system 230, central processing unit (CPU) 235 and telephony interface 240. Removable POD module 155 comprises transport processing, filtering and routing circuitry 250, out-of-band (OOB) signal interface 260, in-band (INB) signal interface 265, and CPU interface 270.

15 RF tuner 205 receives a spectrum of in-band (INB) radio frequency (RF) signals from the cable service provider and is tuned to a signal selected by the cable subscriber using the remote control. The tuned output of tuner 205 is then demodulated by demodulation circuitry 210 (using, for example, QAM demodulation) to produce a digital baseband signal that is transmitted to INB interface 265 in POD module 155. In some
20 systems, digital cable set top box 150 may be a two-way device. Therefore, digital cable set top box 150 may optionally include QPSK transmitter 215, which receives from OOB interface 260 a digital baseband signal generated by POD module 155 and QPSK-modulates the digital baseband signal to produce an RF signal suitable for transmission to the cable service provider. Optionally, digital cable set top box 150 may include digital data
25 receiver 220, which receives an incoming stream of digital baseband data from the cable service provider and transfers it to POD module 155 via OOB interface 260.

As FIGURE 2 indicates, signaling functions are split between host interface 200 and POD module 155. Host interface 200 handles open and standardized signal functions, such as RF front end processing and QPSK modulation and QAM demodulation,
30 and POD module 155 handles proprietary and secure functions, such as data-link and medium access control (MAC) protocols, encryption and decryption of incoming and outgoing data streams, and the like.

Transport processing, filtering and routing circuitry 250 comprises circuitry capable of decoding encrypted digital baseband streams from INB interface 265 to produce,

for example, a decoded MPEG digital data stream. The decoded MPEG digital data stream is then routed back to INB interface 265 and transferred to demultiplexer 225. The demultiplexed MPEG data streams are then sent to MPEG video processing system 230, which generates a conventional television signal that is sent to television set 105.

5 Additionally, command and data signals received by optional telephony interface 240 may be processed by CPU 235 and transmitted through CPU interface 270 to transport processing, filtering and routing circuitry 250 for use, for example, in decoding encrypted video data streams, activating pay-per-view functions, enabling the filtering of premium cable programming, and the like. CPU 235 also processes infrared (IR) control signals received
10 from the remote control by one or both of IR sensor 115 and IR sensor 160.

The present invention takes advantage of the standardized interface connections used by POD module 155 and host interface 200 to provide digital cable set top box 150 with enhanced capabilities beyond conventional digital cable services. In particular, the present invention discloses novel application-specific point-of-deployment (POD)
15 modules that integrate data processors and memory circuitry capable of executing such non-cable TV applications as video games (including interactive games), e-mail, word processing, and the like.

FIGURE 3 illustrates digital cable set top box 150 and novel point-of-deployment (POD) module 300 according to one embodiment of the present invention. The operation and configuration of digital cable set box 150 and POD module 300 is generally the
20 same as described above in FIGURE 2. Digital cable set top box 150 comprises host interface 200, which mates with conventional POD module 300. As before, host interface 200 comprises tuner 205, demodulation (DEMOD) circuitry 210, quadrature phase shift keying (QPSK) transmitter (TX) 215, digital data receiver (RX) 220 demultiplexer (DEMUX) 225, MPEG video processing system 230, central processing unit (CPU) 235 and
25 telephony interface 240. Removable POD module 300 comprises transport processing, filtering and routing circuitry 250, out-of-band (OOB) signal interface 260, in-band (INB) signal interface 265, CPU interface 270, data processor 310, memory 320, and optional user interface (IF) 330. Memory 320 stores user POD application program 340, explained below
30 in greater detail.

RF tuner 205 receives a spectrum of in-band (INB) radio frequency (RF) signals from the cable service provider and is tuned to a signal selected by the cable subscriber using the remote control. The tuned output of tuner 205 is then demodulated by

QPSK demodulation circuitry 210 (using, for example, QAM demodulation) to produce a digital baseband signal that is transmitted to INB interface 265 in POD module 300.

In some systems, digital cable set top box 150 may be a two-way device.

Therefore, digital cable set top box 150 may optionally include QPSK transmitter 215, which
5 receives from OOB interface 260 a digital baseband signal generated by POD module 300 and QPSK-modulates the digital baseband signal to produce an RF signal suitable for transmission to the cable service provider. Digital cable set top box 150 also may include digital data receiver 220, which receives an incoming stream of digital baseband data from the cable service provider and transfers it to POD module 300 via OOB interface 260.

10 Signaling functions are split between host interface 200 and POD module 300.

Host interface 200 handles open and standardized signal functions, such as RF front end processing and QPSK modulation and demodulation, and POD module 300 handles proprietary and secure functions, such as data-link and medium access control (MAC) protocols, encryption and decryption of incoming and outgoing data streams, and the like.

15 Transport processing, filtering and routing circuitry 250 comprises circuitry capable of decoding encrypted digital baseband streams from INB interface 265 to produce, for example, a decoded MPEG digital data stream, which is then routed back to INB interface 265 and transferred to demultiplexer 225. The demultiplexed MPEG data streams are then sent to MPEG video processing system 230, which generates a conventional
20 television signal that is sent to television set 105. Additionally, command and data signals received by optional telephony interface 240 may be processed by CPU 235 and transmitted through CPU interface 270 to transport processing, filtering and routing circuitry 250 for use, for example, in decoding encrypted video data streams, activating pay-per-view functions, enabling the filtering of premium cable programming, and the like. CPU 235 also processes
25 infrared (IR) control signals received from the remote control by one or both of IR sensor 115 and IR sensor 160.

In accordance with the principles of the present invention, the capabilities of POD module 300 are enhanced beyond the standard controlled access and security features normally performed by POD modules used in digital television set top boxes. POD
30 module 300 may be adapted to perform specific applications according to user POD application program 340 executed by data processor 310. For example, in one embodiment of the present invention, POD module 300 may be a video game cartridge that is inserted into digital cable set top box 150. The user plays a video game displayed on screen 110 using a joystick or other control device that is coupled to user interface 330. In another embodiment

of the present invention, POD module 300 may be an e-mail application that the user operates using a keyboard and/or mouse coupled to user interface 330.

The specific application performed by POD module 300 may be a “two-way” application that sends data to the digital cable service provider via QPSK transmitter 215 and receives data from the digital cable service provider via receiver 220 (out-of-band signals) or tuner 205 and demodulation circuitry 210 (in-band signals). Examples of two-way applications include e-mail and interactive video games that may be played through the Internet. The specific application performed by POD module 300 may be a “one-way” application that only receives data from the digital cable service provider via receiver 220 or tuner 205 and demodulation circuitry 210. Finally, the specific application performed by POD module 300 may be a “stand-alone” application that does not interact with the digital cable service provider at all. An example of a stand alone application is a single player video game. In a stand-alone application, tuner 205, demodulation circuitry 210, QPSK transmitter 215 and receiver 220 are not used by POD module 300. Hence, OOB interface 260 may be omitted from POD module 300.

Data processor 310 receives incoming in-band and out-of-band signals from the digital cable service provider via transport processing, filtering and routing circuitry 250 and transmits outgoing signals to the digital cable service provider via transport processing, filtering and routing circuitry 250. Data processor 310 also transmits audio and video data streams generated by user POD application program 340 to television 105 via transport processing, filtering and routing circuitry 250 and demultiplexer 225. The format of the audio and video streams may further utilize the MPEG transport scheme or may simply be digitized baseband audio and video signals.

Data processor 310 may receive user inputs from the digital cable subscriber directly from user interface 330. A number of different types of user inputs may be coupled to user interface 330, including one or more of a joystick for video games, a mouse, and a keyboard. Data processor 310 also may receive user inputs indirectly from the television remote control. Data processor 310 receives IR control signals through CPU 235, CPU interface 270 and transport processing, filtering and routing circuitry 250.

The type of application (or applications) performed by POD module 300 is determined by user POD application 340. As stated above, user POD application 340 may comprise a video game application, including a stand-alone video game that is played on the display screen 110 by a single player and an interactive game that is played by two or more players coupled together by the Internet via the cable service provider network. User POD

application 340 also may comprise an e-mail application and/or a word processor application.

The alphanumeric characters entered by the user are displayed by the e-mail or word processing application on display screen 110, thereby eliminating the need for a separate computer monitor.

5 In an advantageous embodiment of the present invention, memory 320 may comprise random access memory (RAM) as well as a disk storage device capable of storing user POD application program 340 and one or more of audio files, video files, graphics files and text files used by user POD application program 340.

10 Although the present invention has been described in detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.

CLAIMS:

1. For use in a digital cable set top box (150) coupled to a television set (105), a removable circuit apparatus (155) capable of being inserted into a point of deployment (POD) host interface (200) associated with said digital cable set top box (150), said removable circuit apparatus (155) comprising:
 - 5 a point of deployment (POD) module interface (260, 265, 270) capable of mating with said POD host interface (200);
 - a data processor (310) coupled to said POD module interface (260, 265, 270) and capable of transmitting to said digital cable set top box (150) at least one of an audio signal and a video signal capable of being displayed on a screen (110) of said television set
 - 10 (105); and
 - a memory (320) coupled to said data processor (310) capable of storing a user POD application program (340) executable by said data processor (310).
2. The removable circuit apparatus (155) as set forth in Claim 1 wherein said
- 15 data processor (310) is capable of receiving user input signals from said digital cable set top box (150).
3. The removable circuit apparatus (155) as set forth in Claim 1 further comprising a user interface (330) coupled to said data processor (310) capable of receiving
- 20 user inputs from a user input device coupled to said user interface (330).
4. The removable circuit apparatus (155) as set forth in Claim 1 further comprising a disk storage device (320) capable of storing said user POD application program (340).
- 25 5. The removable circuit apparatus (155) as set forth in Claim 1 further comprising a disk storage device (320) capable of storing at least one of audio files, video files, graphics files, and text files associated with said user POD application program (340).

6. The removable circuit apparatus (155) as set forth in Claim 1 wherein said user POD application program (340) comprises a video game program.

7. The removable circuit apparatus (155) as set forth in Claim 1 wherein said
5 user POD application program (340) comprises an e-mail program.

8. For use in a digital cable set top box (150) coupled to a television set (105), a video game apparatus (155) capable of being removably inserted into a point of deployment (POD) host interface (200) associated with said digital cable set top box (150), said video
10 game apparatus (155) comprising:

a point of deployment (POD) module interface (260, 265, 270) capable of mating with said POD host interface (200);

a data processor (310) coupled to said POD module interface (260, 265, 270) and capable of transmitting to said digital cable set top box (150) at least one of an audio
15 signal and a video signal capable of being displayed on a screen (110) of said television set (105);

a memory (320) coupled to said data processor (310) capable of storing a video game application program (340) executable by said data processor (310); and

a user interface (330) coupled to said data processor (310) capable of receiving
20 user inputs from a user input device coupled to said user interface (330).

9. The video game apparatus (155) as set forth in Claim 8 wherein said data processor (310) is capable of receiving user input signals from said digital cable set top box (150).
25

10. For use in a digital cable set top box (150) coupled to a television set (105), an e-mail application apparatus (155) capable of being removably inserted into a point of deployment (POD) host interface (200) associated with said digital cable set top box (150), said e-mail application apparatus (155) comprising:

30 a point of deployment (POD) module interface (260, 265, 270) capable of mating with said POD host interface (200);

a data processor (310) coupled to said POD module interface (260, 265, 270) and capable of transmitting to said digital cable set top box (150) at least one of an audio

signal and a video signal capable of being displayed on a screen (110) of said television set (105);

a memory (320) coupled to said data processor (310) capable of storing an e-mail application program (340) executable by said data processor (310); and

5 a user interface (330) coupled to said data processor (310) capable of receiving user inputs from a user input device coupled to said user interface (330).

1/3

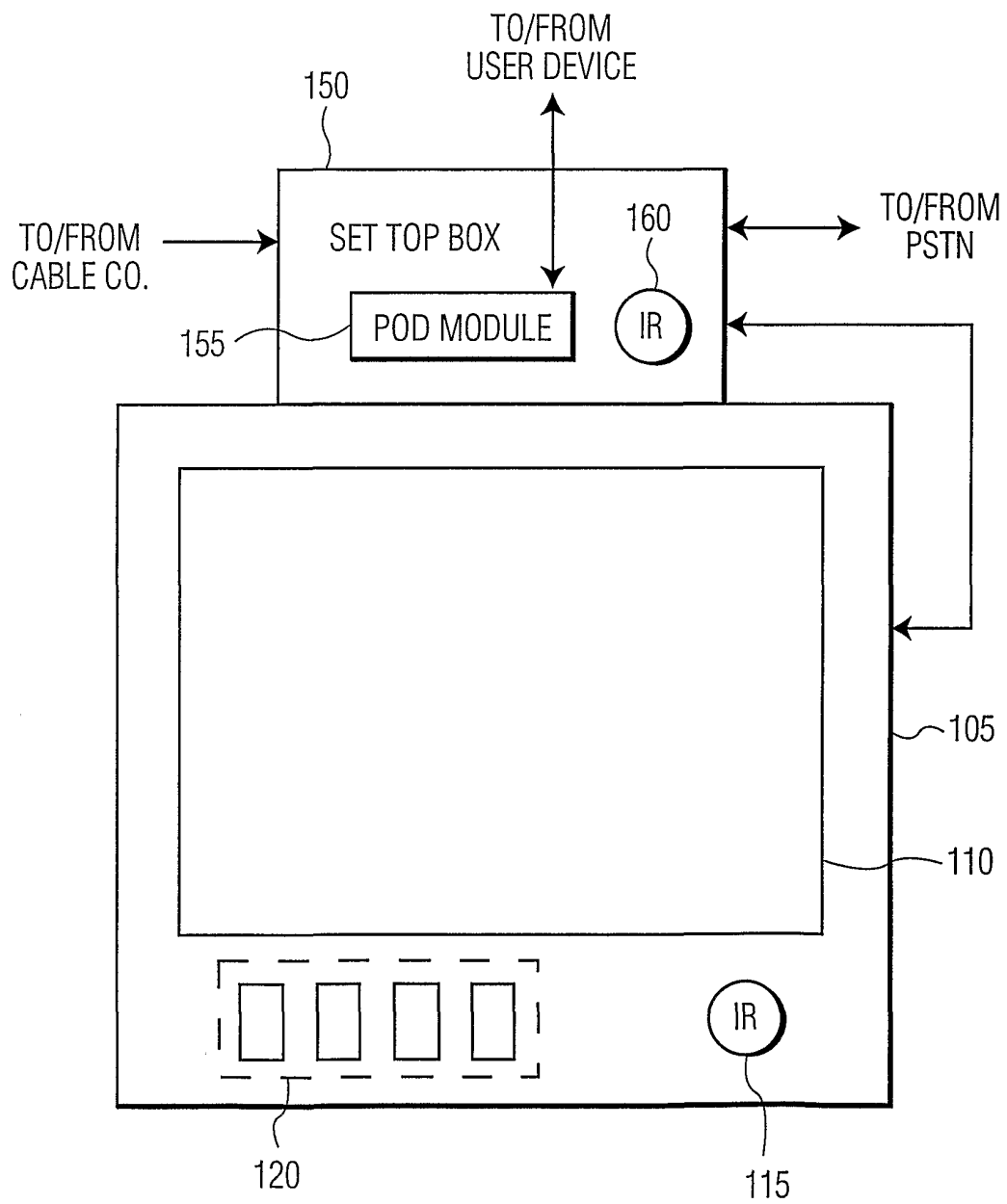


FIG. 1

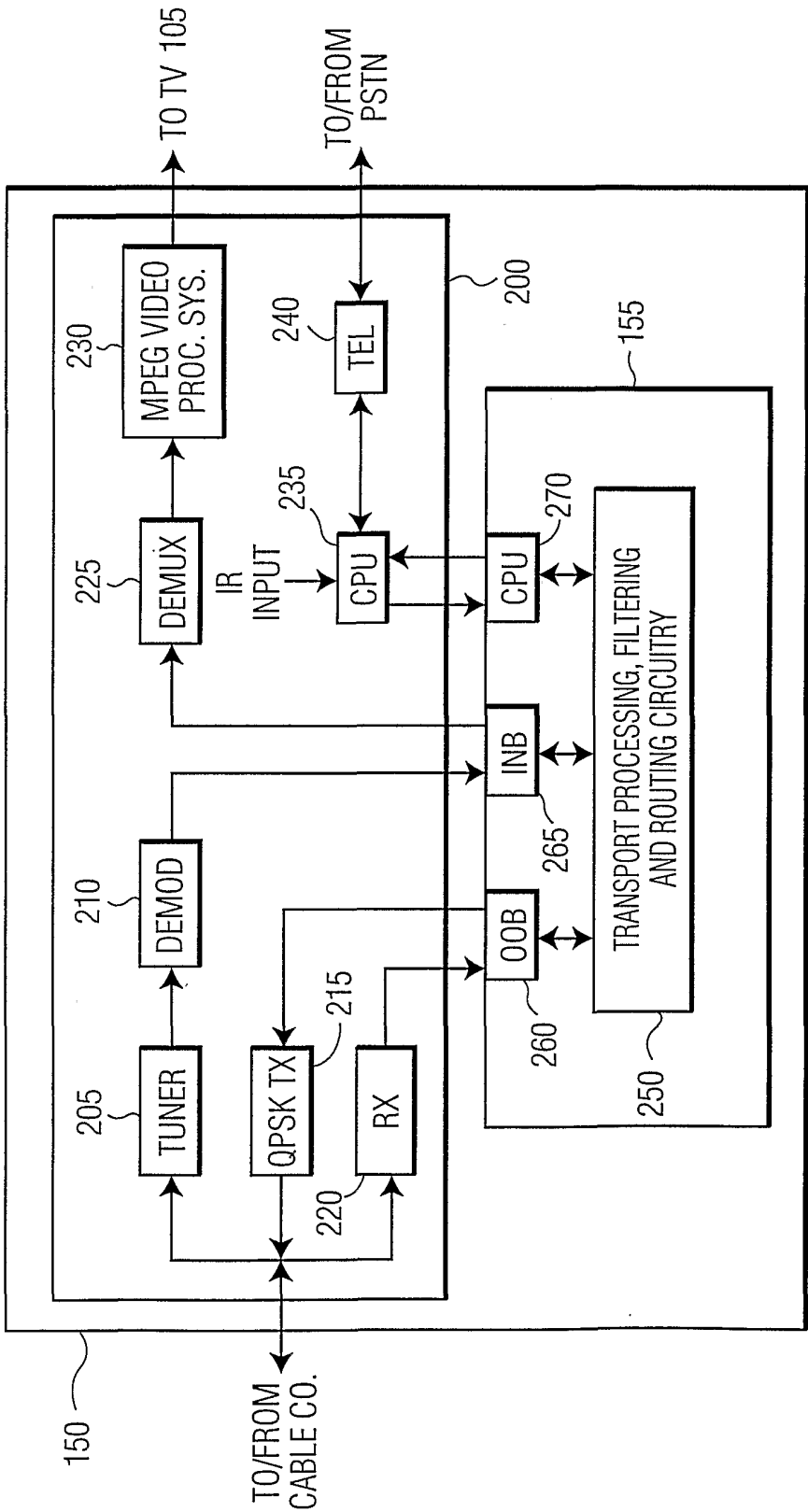


FIG. 2

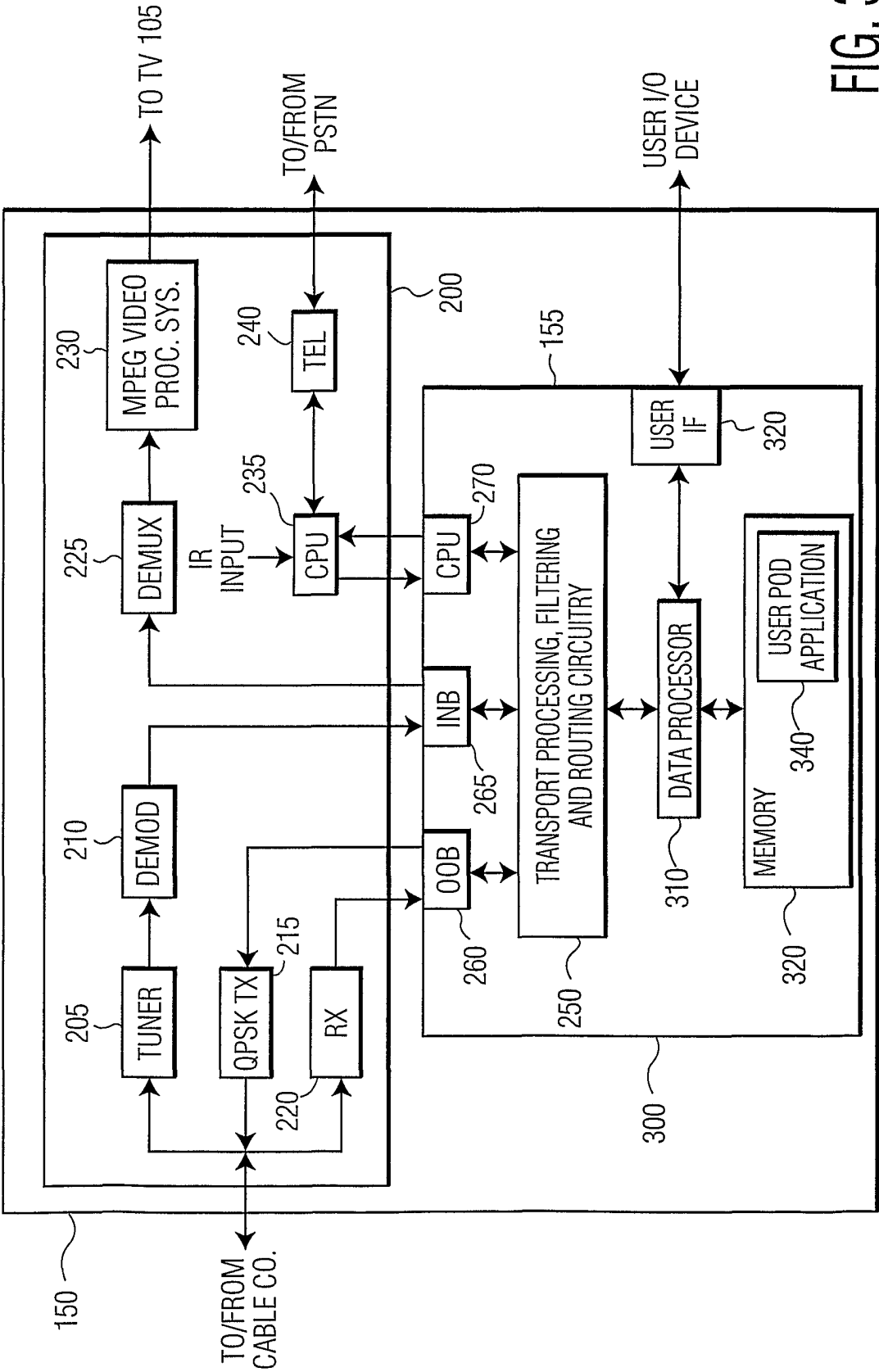


FIG. 3