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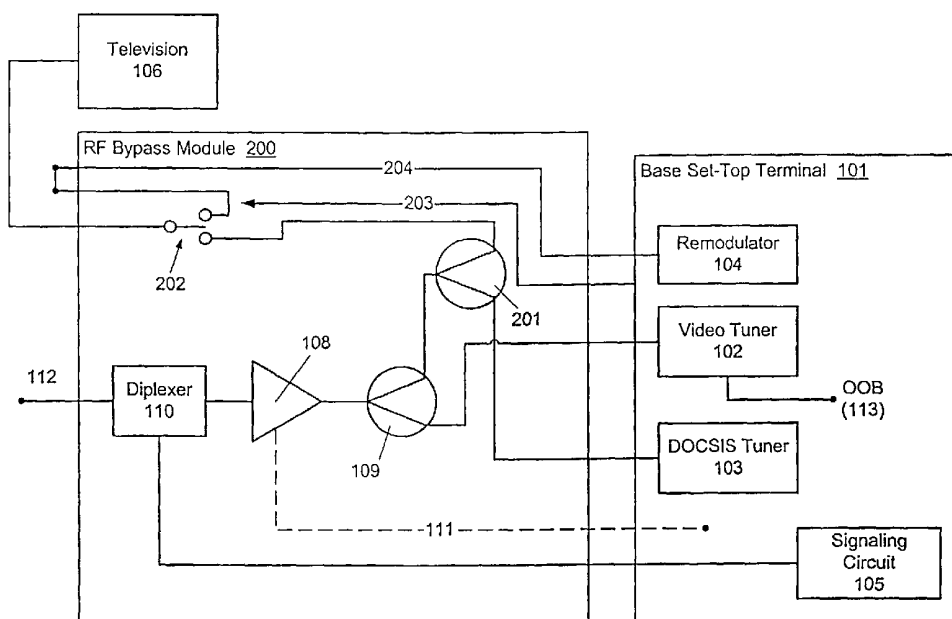
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(54) Title: EXTERNAL MODULES WITH OPTIONAL FEATURES FOR A DUAL-TUNER SET-TOP TERMINAL AND METHOD OF IMPLEMENTING SAME



(57) Abstract: A system of flexibly implementing a set-top terminal for connection of a subscriber's electronic equipment, such as a television set, to a cable network in which a base set-top terminal can be connected to one of a number of different modules. Each module provides a different function or set of functions when connected to the base set-top terminal. This allows the terminal system to flexibly provide exactly that function or combination of functions needed or desired by a subscriber while standardizing manufacture of the base set-top terminal. The need to produce a range of set-top terminal models is eliminated.

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TITLE OF THE INVENTION

External Modules with Optional Features for a Dual-Tuner Set-Top Terminal and Method of Implementing Same

5 FIELD OF THE INVENTION

The present invention relates to the field of cable television systems. Specifically, the present invention relates to the field of set-top terminals that connect subscribers to the cable system. More specifically, the present invention relates to external modules that can be connected to a set-top terminal to provide optional features in the terminal.

10BACKGROUND OF THE INVENTION

15 A set-top terminal is a box of electronics and computer equipment used to connect a subscriber to a cable network. Typically, each subscriber is provided with a set-top terminal that is connected through a co-axial wall outlet to the cable network. The set-top terminal is then also connected to the subscriber's television set, video cassette recorder (VCR) or other electronic devices.

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When so connected, the set-top terminal provides the services of the cable network to the subscriber. For example, the set-top terminal typically receives a cable television signal from the cable network and processes that signal for use by the subscriber's television, VCR or other equipment. This processing may include unscrambling "premium" channels to which the subscriber has subscribed. The set-top terminal may also be used to order and receive pay-per-view or video-on-demand programming, or to provide an electronic program guide for the television programming available over the cable network. In the near future, set-top terminals may also become commonly used to provide a connection between the subscriber's computer and the internet via the cable network, or between the subscriber's telephone and public telephone lines.

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As additional features and services are added to the cable network, the hardware and software of the set-top terminal may need to be upgraded or altered to accommodate the new features and services. Additionally, subscribers in different areas will be subject to different conditions and to the particular bundle of services offered in the area.

For example, in some circumstances, the subscriber may wish to bypass the set-top terminal and provide the incoming cable television signals directly to the television set or other device. This may be the case, as in some cable systems, where the set-top terminal is only used periodically for pay-per-view or video-on-demand services. Rather than constantly connecting and disconnecting the set-top terminal, in such circumstances, the subscriber would want a set-top terminal which includes a bypass circuit so that signals can be routed directly to the television set or other device while bypassing most of the circuitry of the set-top terminal.

In some areas, the subscriber may have access to two or more different cable networks and/or to one or more satellite television systems. Consequently, such a subscriber would prefer a set-top terminal that can include a switch for switching between, for example, two different input signals.

These different needs make it difficult to manufacture set-top terminals. For example, different models of the set-top terminal must be made to provide the various features or combinations of features described above, and others, as needed by subscribers. It would be both expensive and inefficient to incorporate all these features into every set-top terminal made because many subscribers would only need or be able to use a portion of the functions in such a terminal.

Consequently, there is a need in the art for a method and apparatus that efficiently provides all the features any given subscriber needs in a set-top terminal while decreasing the cost and difficulty of manufacturing the set-top terminal.

SUMMARY OF THE INVENTION

It is an object of the present invention to meet the above-described needs and others. Specifically, it is an object of the present invention to provide a method and apparatus that efficiently provides all the features any given subscriber needs in a set-top terminal while decreasing the cost and difficulty of manufacturing the set-top terminal.

Additional objects, advantages and novel features of the invention will be set forth in the description which follows or may be learned by those skilled in the art through reading these materials or practicing the invention. The objects and advantages of the invention may be achieved through the means recited in the attached claims.

To achieve these stated and other objects, the present invention may be embodied and described as a modular set-top terminal system in which any of several modules can be added to a base terminal to assist in processing and routing signals from the cable television network to the electronic equipment of that subscriber. In other words, the system of the present invention includes a base set-top terminal and a module for connection to that base set-top terminal. The module provides additional hardware features for the base set-top terminal so that the system can be "customized" by selecting the module providing the exact feature or set of features desired by a particular subscriber.

A base module may simply include circuitry for passing a television signal from the cable television network to the base set-top terminal and a diplexer for sending signals from the base set-top terminal over the cable television network.

A more advanced module may be a bypass module for allowing an incoming signal to selectively bypass the base set-top terminal before being output by the system for use by the subscriber's electronic equipment. The bypass module includes a switch controlled by a control signal from the base set-top terminal for selectively bypassing the base set-top terminal with the incoming signal.

The module may also be an A/B switching module for selectively providing an incoming signal to the base set-top terminal from either a first or second signal source. The A/B switching module includes a switch controlled by a control
5 signal from the base set-top terminal for selectively connecting the base set-top terminal with the incoming signal from either the first or second signal source.

The module may also be a combination bypass--A/B switching module combining the features and functions of the
10 bypass and A/B switching modules. Other types of modules providing different features or functions for the base set-top terminal are within the scope of the present invention.

Any of these modules may also be configured to route appropriate signals to two or more separate tuners within the
15 base set-top terminal. This, consequently, facilitates the use of multiple tuners in the set-top terminal to provide more efficient signal processing service.

The present invention also encompasses a method of implementing the set-top terminal system described above for
20 providing a television signal from a cable television network to the electronic equipment of a subscriber. Specifically, the method of the present invention includes connecting a separately-manufactured module to a base set-top terminal, the module providing additional hardware features for the
25 base set-top terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the present invention and are a part of the specification. Together with
30 the following description, the drawings demonstrate and explain the principles of the present invention.

Fig. 1 is a block diagram of a basic module and set-top terminal according to the present invention.

Fig. 2 is a block diagram of a bypass module for a set-top
35 terminal according to the present invention.

Fig. 3 is a block diagram of an A/B switch module for a set-top terminal according to the present invention.

Fig. 4 is a block diagram of a combination bypass--A/B switch module for a set-top terminal according to the present invention.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Using the drawings, the preferred embodiments of the present invention will now be explained. The present invention provides a system for creating a set-top terminal that has those specific hardware features needed by a particular subscriber without manufacturing a variety of different terminal models, each with a different combination of hardware features. To accomplish this, the present invention includes a base set-top terminal to which a variety of modules providing different hardware features can be connected. In this way, the base set-top terminal is always manufactured in the same manner, and different models of the terminal are eliminated. This reduces the cost and difficulty of manufacturing the terminal. The various hardware features, or combinations of features, are provided by the add-on modules which can be purchased selectively according to the needs of specific subscribers.

Fig. 1 illustrates a first embodiment of the present invention in a block diagram. As shown in Fig. 1, a base set-top terminal (101) includes a number of components that will be described below. In addition, it will be understood by those skilled in the art that the set-top terminal (101) also includes a central processor (not shown) for performing the signal processing and control functions of the set-top terminal (101).

The base set-top terminal (101) includes, for example, a video tuner (102) for tuning a particular television channel, in analog or digital format, from the incoming cable television signal (112). Preferably, the video tuner (102) has broad tuning capabilities and can tune an analog video channel that is either (1) a standard, clear analog channel, for example, under the standards of the National Television Standard Committee (NTSC), (2) a scrambled analog signal or

(3) a digital channel, for example, a quadrature-amplitude modulated (QAM) channel carrying video, audio and/or data.

The video tuner (102) can also preferably tune an out-of-band (OOB) (113) signal on which programming or
5 instructions for the terminal (101) may be broadcast by the cable system operator. Additionally, the tuner (102) may also be capable of tuning DOCSIS channels, i.e., channels broadcast according to the Data Over Cable Service Interface Specification (DOCSIS).

10 A second tuner (103) may also be included in the base set-top terminal (101). This second tuner (103) may be identical to the first tuner (102) with broad capability to tune channels in various formats. This can enhance the subscriber's use of the terminal (101) by allowing the
15 simultaneous tuning of two channels. Tuning two separate channels simultaneously may be desired to separately provide different channel signals to a television set and a VCR or to create a picture-in-picture (PIP) display on the television set of the two channels simultaneously.

20 Alternatively, the first and second tuners (102 and 103) may be dedicated to slightly different functions. For example, one of the two tuners (102 or 103) may be used for tuning analog television channels, while the other tuner provides the capability of tuning digital channels in the
25 quadrature-amplitude-modulation (QAM) or vestigial-side-band (VSB) formats.

In another configuration, the first tuner (102) may be a video tuner like that described above, capable of producing a video signal by tuning channels in various formats. While,
30 the second tuner (103) may be dedicated to receiving data in the DOCSIS format and may not be accompanied by the electronics necessary to produce a video signal. This configuration would essentially provide a terminal (101) with a dedicated video path via the first tuner (102) and a
35 dedicated data path via the second tuner (103). This configuration is illustrated in the drawings with the second tuner (103) being indicated as a DOCSIS tuner.

A re-modulator (104) is also provided in the set-top terminal (101) for outputting a processed, modulated signal ready for use by the television or other electronic equipment of the subscriber. As shown in Fig. 1, the re-modulator
5 (104) is consequently connected, for example, to a television set (106). Alternatively, the output of the terminal (101) could be provided to, for example, a VCR, a computer, etc.

It may be necessary, particularly in advanced systems, for the set-top terminal (101) to communicate "up-stream"
10 with the headend of the cable network. Consequently, the terminal (101) also preferably includes a signaling circuit (105) for sending a signal from the terminal (101), over the cable network to the headend facility of the network. This is a requirement for a DOCSIS connection.

These components constitute the base set-top terminal
15 (101) of the present invention and provide the basic functionality of the set-top terminal. In addition, under the principles of the present invention, a variety of different modules, each providing different hardware
20 features, can be used in conjunction with the base set-top terminal (101) to provide the functions needed or desired by particular users.

For example, Fig. 1 illustrates a base module (107) that provides only the minimal hardware to support the functions
25 of the base set-top terminal (101) without providing any additional functionality. The base module (107) includes a diplexer (110) that is connected to the cable network (112).

The diplexer (110) is also connected to the signaling circuit (105) as shown in Fig. 1. The diplexer (110)
30 controls the direction of signal traffic to and from the set-top terminal (101) based on frequency selectivity. Consequently, it is the diplexer (110) that allows the transmission of signals from the set-top terminal (101) to be transmitted "up-stream" to the headend facility while also
35 providing "down-stream" reception of the cable television signal for the set-top terminal (101). The signal received by the diplexer (110) from the cable network (112)

is output to an amplifier (108). The amplifier (108) is powered by a connection (111) to the base set-top terminal (101). Typically, the set-top terminal (101) is independently powered from an A/C electrical wall outlet.

5 A splitter (109) splits the incoming television signal to provide it to both of the two tuners (102 and 103) of the set-top terminal (101). The inclusion of the amplifier (108) in this module, and the other modules described below, improves the overall noise response of the terminal (101),
10 which would otherwise be degraded by splitting the input signal for the two separate tuners (102 and 103) and consequently reducing the power of the input signal.

Fig. 2 illustrates a base set-top terminal (101) of the present invention that is connected to a bypass module (200).
15 The bypass module (200) provides the additional hardware function of routing the incoming television signal from the cable network (112) to the television set (106) or other equipment while bypassing the circuitry of the base set-top terminal (101). The base set-top terminal (101) is identical
20 to that shown in Fig. 1 and will not, therefore, be described again in detail.

Similar to the base module (107), the bypass module (200) includes the diplexer (110) connected to the signaling unit (105), the amplifier (108) powered by the set-top
25 terminal (101) and the splitter (109). However, the splitter (109) is not directly connected to both of the tuners (102 and 103). Rather, the lower branch of the splitter (109) is connected to the video tuner (102), while the upper branch is connected to a second splitter (201) instead of to the DOCSIS
30 tuner (103).

The lower branch of the second splitter (201) is connected to the DOCSIS tuner (103) and provides the incoming cable signal from the cable network (112) to the DOCSIS tuner (103) in the same form as provided by the base module (107)
35 in Fig. 1. The upper branch of the second splitter (201) is connected to a switch (202). The switch (202) selectively connects either the output of the set-top terminal (101) or

the signal from the upper branch of the second splitter (201) to, for example, the television set (106) or other electronic equipment of the subscriber. In this way, depending on the position of the switch (202), the television set (106) can either receive the output (204) of the set-top terminal (101) or can directly receive the signal from the cable network (112) without that signal having been processed by the set-top terminal (101).

The switch (202) is preferably controlled by a control signal (203) from the set-top terminal (101). Consequently, the user can control whether the signal received by the television set (106) is processed through the set-top terminal (101) by controlling the switch (202) through the set-top terminal (101). The set-top terminal (101) will typically include a user input device, such as keypad, switches, etc., on the terminal itself or on a remote control device so that the user can control such functions as the position of the switch (202).

Fig. 3 illustrates a base set-top terminal (101) of the present invention that is connected to an A/B switching module (300). The A/B switching module (300) provides the additional hardware function of allowing the set-top terminal (101) to receive an input signal from one of two different sources (112 or 112A). For example, the A/B switching module (300) is connected to a cable network (112) and another signal source (112A). The other signal source (112A) may be, but is not limited to, a second cable network, a terrestrial UHF or VHF television antenna, or a satellite television dish. The base set-top terminal (101) is identical to that shown in Fig. 1 and will not, therefore, be described again in detail.

Similar to the base module (107), the A/B switching module (300) includes the diplexer (110) connected to the signaling unit (105), the amplifier (108) powered by the set-top terminal (101) and the splitter (109). However, the splitter (109) is not directly connected to both of the tuners (102 and 103). Rather, the lower branch of the

splitter (109) is still connected to the DOCSIS tuner (103), while the upper branch is connected to a switch (301).

The switch (301) selectively connects the video tuner (102) of the set-top terminal (101) to an incoming television signal from either the cable network (112) or the other
5 signal source (112A). In this way, the set-top terminal (101) can receive an input signal from either of the two signal sources (112 and 112A) for use by the subscriber's television set (106) or other electronic equipment.

10 The switch (301) is preferably controlled by a control signal (302) from the set-top terminal (101). Consequently, by controlling the switch (301) through the set-top terminal (101), the user can control whether the signal output to the television set (106) by the set-top terminal (101) is the
15 signal provided by the cable network (112) or from the other signal source (112A). As before, the set-top terminal (101) will include a user input device, such as keypad, switches, etc., on the terminal itself or on a remote control device so that the user can control such functions as the position of
20 the switch (301). Optionally, the control of the switch (301) can be transparent to the user, dynamically set by the host processor of the set-top terminal (101) on a channel-by-channel basis depending on which network (112 or 112A) a particular program channel resides.

25 Fig. 4 illustrates a combination module (400) that provides both terminal bypass and A/B switching functions. The combination module (400) provides the additional hardware functions of allowing the set-top terminal (101) to receive
30 an input signal from either of the two different sources (112 or 112A), with or without processing the input signal through the base set-top terminal (101). The base set-top terminal (101) is identical to that shown in Fig. 1 and will not, therefore, be described again in detail.

35 Similar to the base (107), bypass (200) and A/B switching (300) modules, the combination module (400) includes the diplexer (110) connected to the signaling unit (105), the amplifier (108) powered by the set-top terminal

(101) and a first splitter (109). The lower branch of the splitter (109) is connected to the DOCSIS tuner (103). The upper branch of the splitter (109) is connected to a first switch (301).

5 The switch (301) selectively connects a second splitter (201) to incoming an television signal from either the first (112) or second (112A) signal sources. The lower branch of the second splitter (201) is connected to the video tuner (102). Consequently, the set-top terminal (101) can receive
10 an input signal from either of the two signal sources (112 and 112A) for use by the subscriber's television set (106) or other electronic equipment.

 The upper branch of the second splitter (201) is connected to a second switch (202). The second switch (202)
15 selectively connects the television set (106), or other electronic equipment of the subscriber, to the output (401) of the base set-top terminal (101) or to the incoming signal from either of the two signal sources (112 or 112A) without that signal having been passed through the base set-top
20 terminal (101). In this way, the combination module (400) provides both terminal bypass and A/B switching functions. Specifically, depending on the positions of the first and second switches, the combination module (400) can provide any of four output signals to the television set (106), i.e., (1)
25 the signal from source (112) as processed by the set-top terminal (101); (2) the signal from source (112A) as processed by the set-top terminal (101); (3) the signal from source (112) bypassing the set-top terminal (101); or (4) the signal from source (112A) bypassing the set-top terminal
30 (101).

 As before, the switches (202 and 301) are preferably controlled, respectively, by control signals (203 and 302) from the set-top terminal (101). Consequently, by
controlling the switches (203 and 301) through the set-top
35 terminal (101), the user can control whether the signal output to the television set (106) by the set-top terminal (101) is the signal provided by the cable network (112) or

from the other signal source (112A) and whether that signal is processed by or bypasses the base set-top terminal (101).

5 As before, the set-top terminal (101) will include a user input device, such as keypad, switches, etc., on the terminal itself or on a remote control device so that the user can control such functions as the position of the switches (203 and 301). Alternatively, the A/B switch can be controlled automatically by the host processor of the set-top
10 terminal (101) depending on which network (112 or 112A) a particular program channel resides.

Preferably, the base set-top terminal (101) and each independent module, e.g. (107, 200, 300 or 400), are each provided in a separate housing (101, 107, 200, 300 or 400).
15 Each of these housing may be completely enclosed with appropriate ports and connectors for interfacing the base terminal (101) with a module (107, 200, 300, 400) in the manner described. Alternatively, either the base set-top terminal (101) or the module (107, 200, 300 or 400) may be
20 partially open to allow for the connections between terminal (101) and module (107, 200, 300 or 400) described above. As another alternative, the module (107, 200, 300 or 400) may be provided on, for example, a circuit board that is mounted within the housing (101) of the base set-top terminal.

25 It is also preferably to minimize the number of electrical connections between each module (107, 200, 300 and 400) and the base terminal (101) to make it as easy as possible to connect each module to the terminal. Consequently, in a preferred embodiment, only four signal
30 paths are needed between any module and a base terminal (101) that includes two tuners, i.e. the connection to the first or video tuner (102), the connection to the second or DOCSIS tuner (103), the connection to the remodulator (104), and the connection to the signaling circuit (105).

35 The power (111) for the amplifier (108) can be carried on the same signal path that connects the DOCSIS tuner (103) to the module (107, 200, 300 or 400). With the bypass module

(200), the bypass switch control signal (203) may be carried on the same signal path that connects the video tuner (102) to the module (200). With the A/B switch module (300), the A/B switch control signal (302) may be carried on the same
5 signal path that connects the video tuner (102) to the module (300). Finally, with the combination module (400), the A/B switch control signal (302) may be carried on the same signal path that connects the video tuner (102) to the module (400) and the bypass switch control signal (203) may be carried on
10 the same signal path that connects the remodulator (104) to the module (400).

The amplifier power (111) and switch control signals (203 and 302) are generated and combined with the RF signal lines, as described above, in the terminal (101) and then
15 passed to the module. In the module, the amplifier power (111) and control signals (203 and 302) are separated from the RF signals and utilized accordingly. This minimizes the number of connections between the terminal and the module.

Consequently, the present invention allows the
20 consistent and less expensive manufacturing of a single base set-top terminal model while subscribers can obtain precisely the feature or combination of features needed by connecting the appropriate module or modules to the base set-top terminal. Moreover, the electrical connection structure
25 between a module and the base set-top terminal is made as simple as possible. This reduces the cost of manufacturing the system and ensures that subscribers receive and pay for only those features they need or can use.

The preceding description has been presented only to
30 illustrate and describe the invention. It is not intended to be exhaustive or to limit the invention to any precise form disclosed. Many modifications and variations are possible in light of the above teaching. The preferred embodiments were chosen and described to best explain the principles of the
35 invention and its practical application. The preceding description is intended to enable others skilled in the art to best utilize the invention in various embodiments and with

various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims.

WHAT IS CLAIMED IS:

1. A set-top terminal system for providing a television signal from a cable television network to electronic equipment of a subscriber, the system comprising:
a base set-top terminal; and
5 a module for connection to said base set-top terminal, said module providing additional hardware features for said base set-top terminal;
said system further comprising at least one input for receiving said television signal, and an output for
10 outputting an output signal to said electronic equipment.
2. The system of claim 1, wherein said module comprises:
circuitry for passing said television signal from said cable television network to said base set-top terminal; and
5 a diplexer for sending signals from said base set-top terminal over said cable television network.
3. The system of claim 2, wherein said base set-top terminal includes two separate tuners and said module comprises a splitter for providing said television signal to both of said tuners.
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4. The system of claim 1, wherein said base set-top terminal includes two separate tuners and said module comprises a splitter for providing said television signal to both of said tuners.
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5. The system of claim 2, wherein said base set-top terminal further includes an amplifier circuit for amplifying said television signal as said television signal is split by said splitter.
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6. The system of claim 1, wherein said module is a bypass module for allowing an incoming signal to selectively bypass said base set-top terminal before being output by said system for use by said electronic equipment.

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7. The system of claim 6, wherein said bypass module comprises a switch controlled by a control signal from said base set-top terminal for selectively bypassing said base set-top terminal with said incoming signal.

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8. The system of claim 1, wherein said module is an A/B switching module for selectively providing an incoming signal to said base set-top terminal from either a first or second signal source.

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9. The system of claim 8, wherein said A/B switching module comprises a switch controlled by a control signal from said base set-top terminal for selectively connecting said base set-top terminal with said incoming signal from either said first or second signal source.

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10. The system of claim 1, wherein said module is combination bypass--A/B switching module for allowing an incoming signal to selectively bypass said base set-top terminal before being output by said system for use by said electronic equipment and for selecting a source of said incoming signal from between first and second signal sources.

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11. The system of claim 10, wherein said combination module comprises:

a first switch controlled by a first control signal from said base set-top terminal for selectively bypassing said base set-top terminal with said incoming signal; and

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a second switch controlled by a second control signal from said base set-top terminal for selectively connecting said base set-top terminal with said incoming signal from either said first or second signal source.

12. The system of claim 1, wherein said base set-top terminal and said module are respectively provided in separate housings.

13. A method of implementing a set-top terminal system for providing a television signal from a cable television network to electronic equipment of a subscriber, the method comprising connecting a separately-manufactured module to a
5 base set-top terminal, said module providing additional hardware features for said base set-top terminal.

14. The method of claim 13, further comprising:
passing a television signal from said cable television network to said base set-top terminal through said module;
and
5 sending signals from said base set-top terminal over said cable television network with said module.

15. The method of claim 13, further comprising
splitting said television signal in said module to provide said television signal to both of two tuners in said base
set-top terminal.
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16. The method of claim 13, further comprising, with said module, selectively removing said base set-top terminal from a signal path of an incoming signal.

17. The method of claim 16, further comprising
controlling said selective removal of said base set-top terminal from said signal path with a control signal from
said base set-top terminal.
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18. The method of claim 13, further comprising, with said module, selectively providing an incoming signal to said base set-top terminal from either a first or second signal source.
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19. The method of claim 18, further comprising controlling said selection of said incoming signal from said first or second signal source with a control signal from said base set-top terminal.

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20. The method of claim 13, further comprising housing said base set-top terminal and said module in separate housings.

21. A set-top terminal system for providing a television signal from a cable television network to electronic equipment of a subscriber, the system comprising:

a base set-top terminal; and

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means for connection to said base set-top terminal, said means providing additional hardware features for said base set-top terminal;

said system further comprising at least one input for receiving said television signal, and an output for outputting an output signal to said electronic equipment.

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22. The system of claim 21, wherein said means comprises:

means for passing a television signal from said cable television network to said base set-top terminal; and

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means for sending signals from said base set-top terminal over said cable television network.

23. The system of claim 21, wherein said means for connection to said base set-top terminal comprise means for allowing an incoming signal to selectively bypass said base set-top terminal before being output by said system for use by said electronic equipment.

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24. The system of claim 21, said means for connection to said base set-top terminal comprise means for selectively providing an incoming signal to said base set-top terminal from either a first or second signal source.

25. A set-top terminal system for providing a television signal from a cable television network to electronic equipment of a subscriber, the system comprising:

a base set-top terminal; and

5 two or more modules for connection to said base set-top terminal, each of said modules providing a different set of additional hardware features for said base set-top terminal;

10 said system further comprising at least one input for receiving said television signal, and an output for outputting an output signal to said electronic equipment.

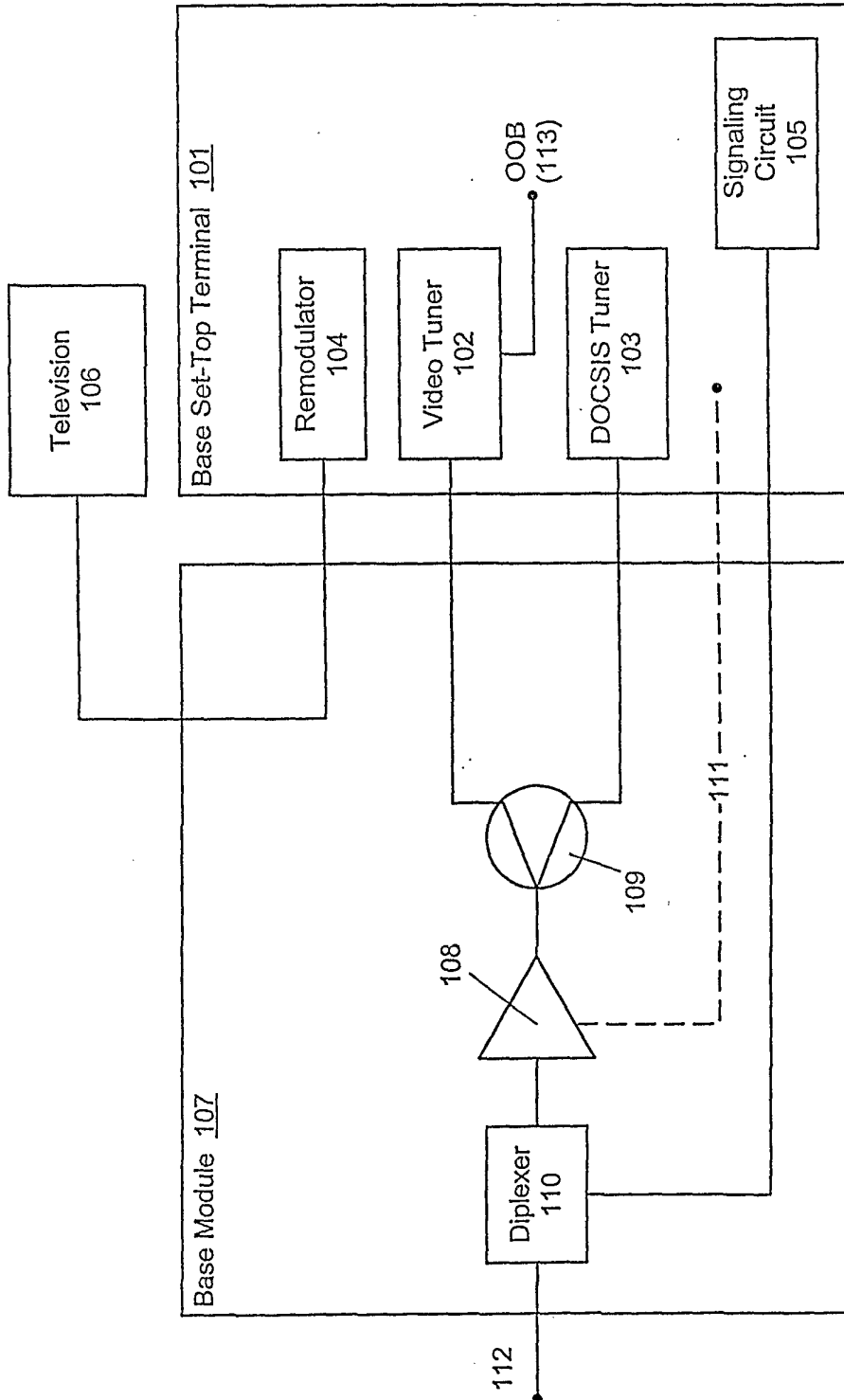


Fig. 1

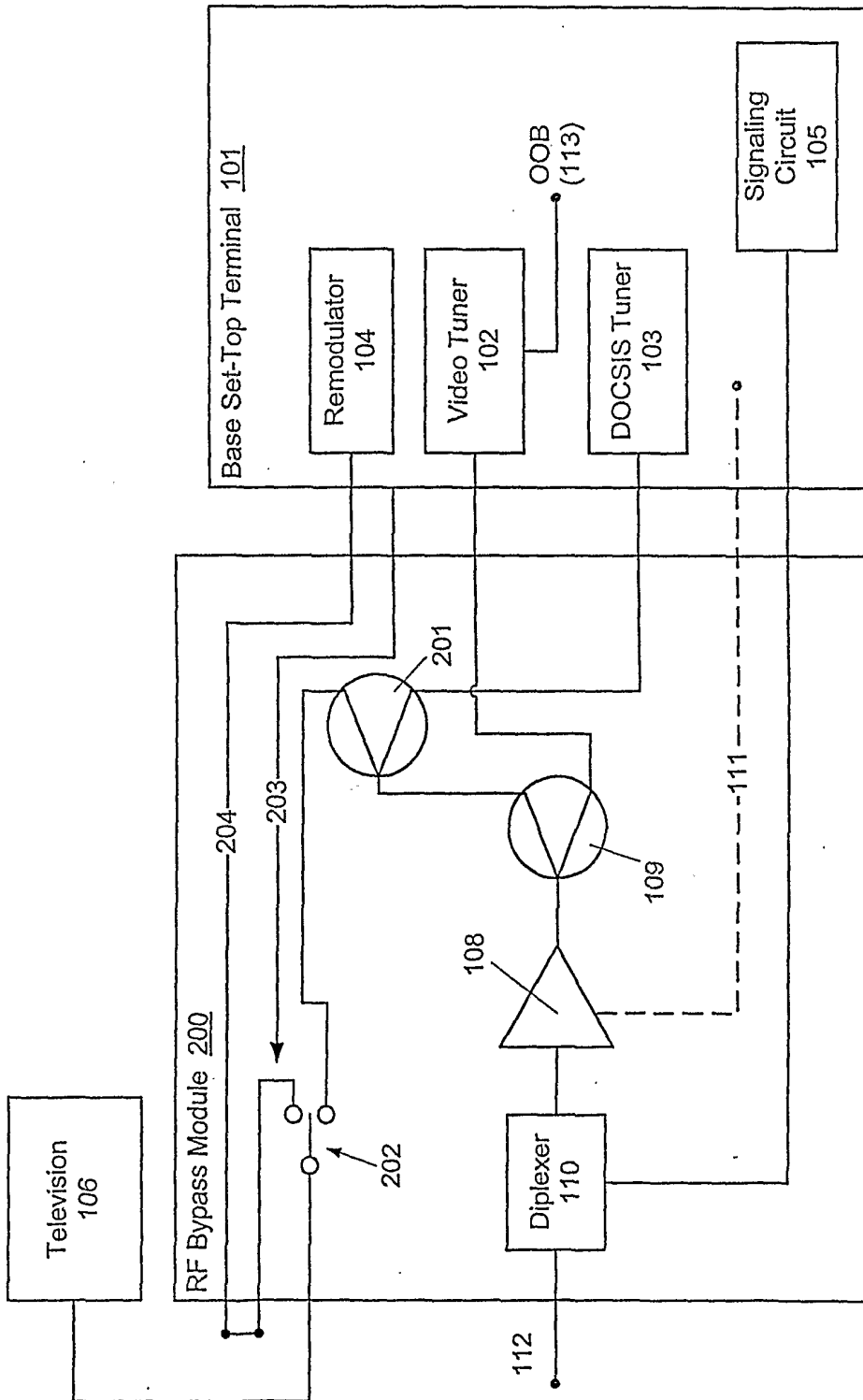


Fig. 2

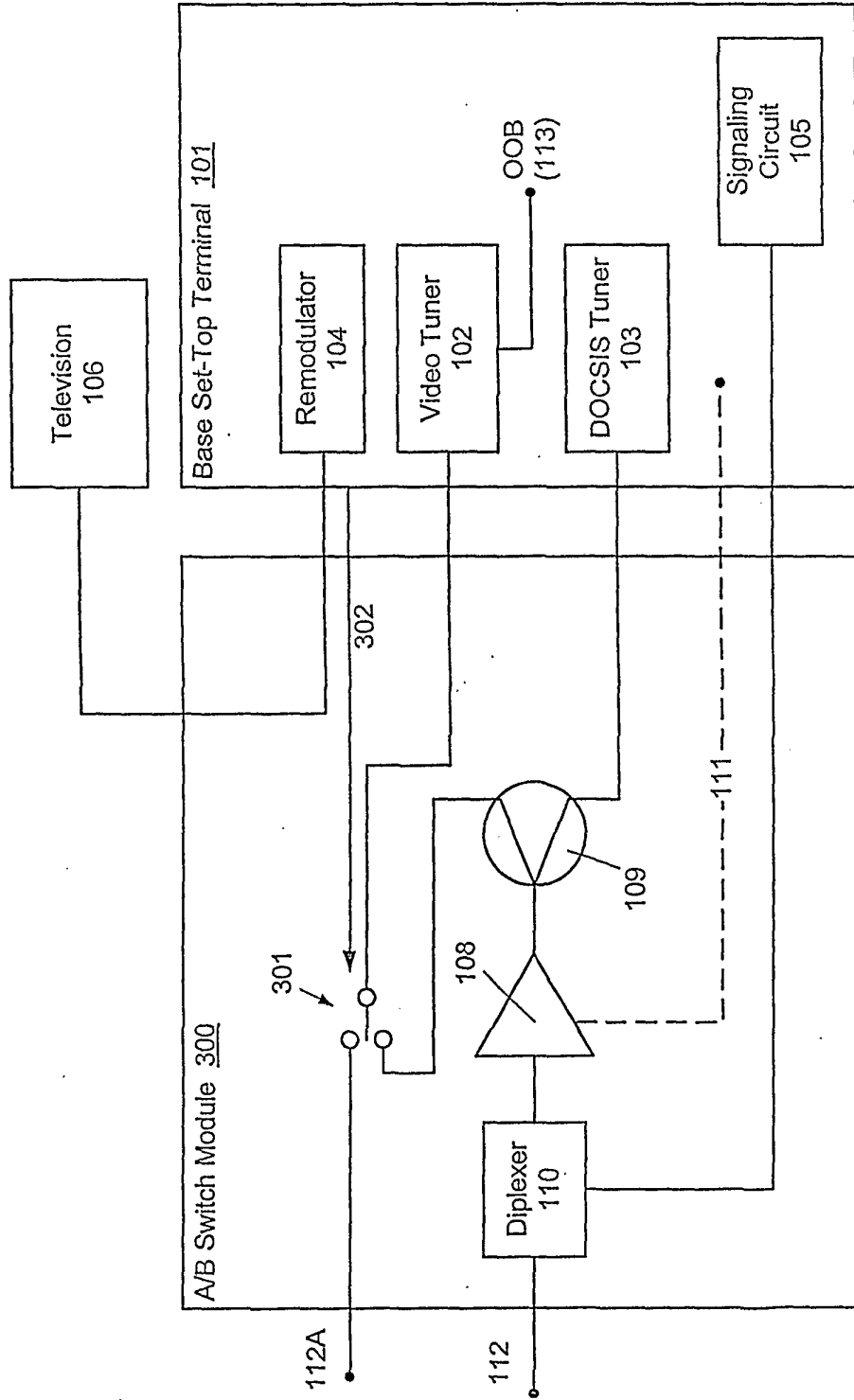


Fig. 3

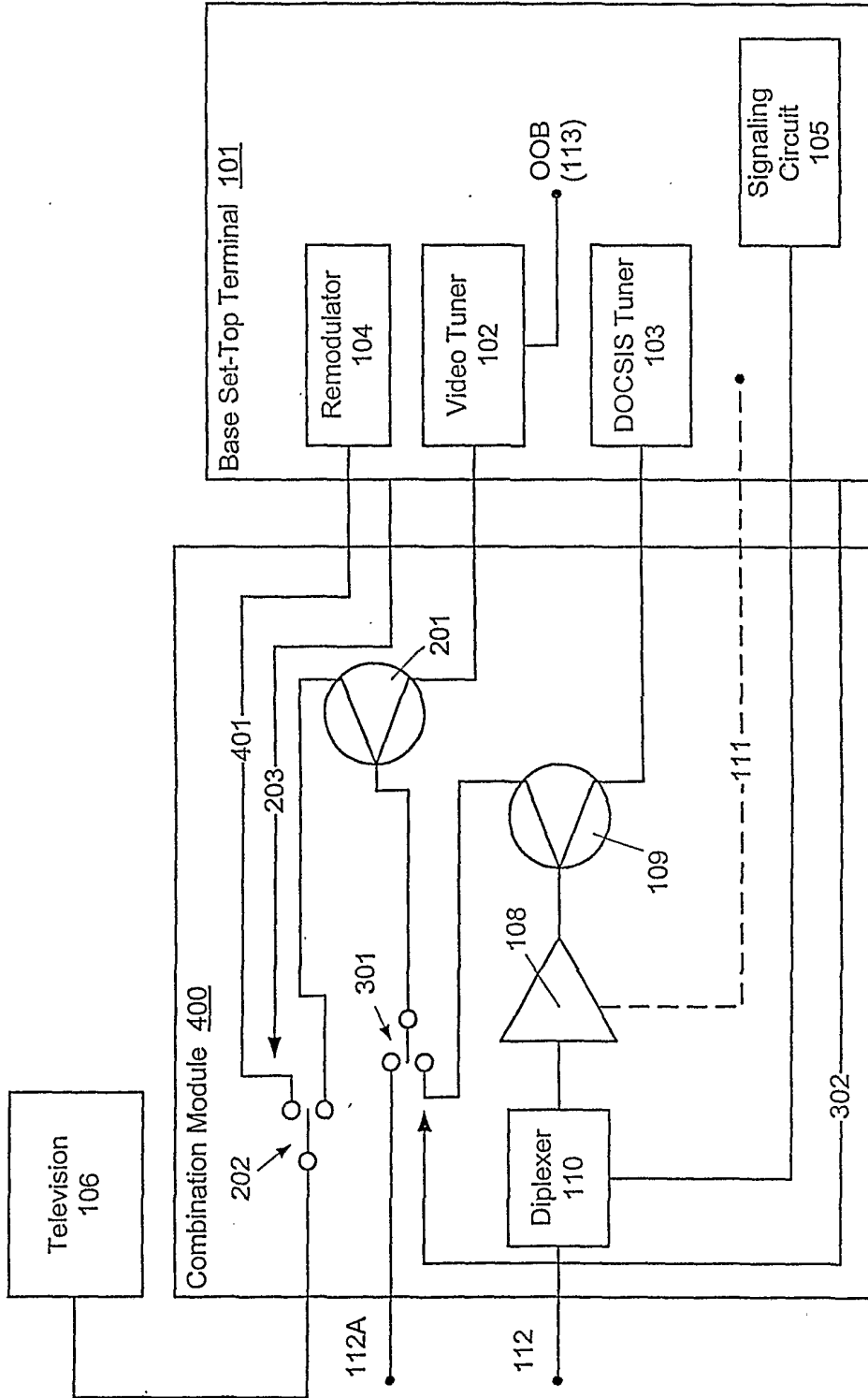


Fig. 4

INTERNATIONAL SEARCH REPORT

Int. Patent Application No
PCT/US 00/29644

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N5/00 H04N7/10

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)
IPC 7 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 practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 21309 A (GEN INSTRUMENT CORP) 29 April 1999 (1999-04-29)	1, 6, 12, 13, 16, 20, 21, 23, 25
Y	page 7, line 4 - page 9, line 12; figure 2	2-4, 7, 14, 15, 17, 22
A	---	5, 8-11, 18, 19, 24
Y	WO 98 12874 A (SARNOFF CORP) 26 March 1998 (1998-03-26)	2-4, 7, 14, 15, 17, 22
A	page 5, line 4 - line 14; figure 1A --- -/--	1, 13, 21, 25

Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents :

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O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search 23 January 2001	Date of mailing of the international search report 30/01/2001
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Beaudoin, O
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INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/US 00/29644

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 94 13107 A (DISCOVERY COMMUNICAT INC) 9 June 1994 (1994-06-09) page 48, line 27 -page 49, line 6; figures 9A,9B -----	1,12,13, 20,21,25 2-11, 14-19, 22-24

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