PICTURE-IN-GUIDE GENERATOR WITH DIGITAL TUNER

BACKGROUND OF THE INVENTION

The present invention relates generally to electronic program guide systems and methods, and more particularly, to a system and method of providing a picture-in-guide display using a picture-in-guide generator with a digital tuner.

The disclosures of the following patent applications are incorporated fully herein by reference: Application No. 08/475,395 filed June 7, 1995; International Application WO96/07270; Application No. 60/053,330 filed July 21, 1997; Application No. 60/061,119 filed October 6, 1997; and Application No. 60/055.237 filed August 12, 1997. Also incorporated by reference is the publication entitled "The CTC140 Picture in Picture System (CPIP) Technical Training Manual" available from Thomson Consumer Electronics, Inc., Indianapolis, IN.

An electronic program guide (EPG) provides a television viewer with updatable television schedule information in the form of an on-screen graphical display. The EPG may provide scheduling information for current and future broadcast programs as well as summaries of television program content for a particular program.

One particularly convenient format for an EPG is a picture-in-guide (PIG) display. A PIG display includes a real-time video image of a tuned television program displayed in a small window inset in a larger graphic guide. The PIG display provides many options to the viewer. The viewer may continue to view the television program s/he was watching before entering the guide while browsing through the television scheduling information in the guide. Alternatively, the program displayed in the PIG window may change to correspond to a selected channel in the guide as the viewer cursors through program listings in the guide. The viewer may also pull up the PIG display to find out more information about the program s/he is currently watching, such as start/stop time or a program synopsis, while continuing to view the program in the inset PIG window.

Typically, a PIG display is produced using an EPG generator, which includes a microprocessor, a vertical blanking interval (VBI) decoder/slicer, an on-screen display generator, a digital-to-analog converter (DAC), synchronization (synch) circuitry, and a memory on one chip, and a separate chip including a picture-in-picture (PIP) generator, a DAC, synch circuitry, and microprocessor interface circuitry.

The PIP generator uses a video signal and memory to create a big background picture and a small inset picture. The small picture is generated by storing entire frames from the video signal into memory. Complex filtering is performed on these frames stored in memory to achieve high quality but reduced in size images. As a result, a composite display having a big picture in the background and a small picture as an inset, the PIP window area on the screen of the television monitor, is generated.

However, the use of a PIP generator is often costly. For instance, the memory in the PIP generator is relatively expensive compared to the rest of the components in the PIP generator. Also, high speed computational processing is required to perform the complex filtering. Also, using separate chips for the EPG generator and PIP generator requires more components and is more difficult to integrate into consumer electronics components such as televisions, VCR's, satellite receivers, or the like.

For a PIG display, however, it is unnecessary to provide two real-time video images since the main display comprises textual and graphical information, e.g., a program guide, and not a real-time, moving video image. Thus, through the use of a PIG generator, significant cost saving is achievable. Also, the addition of a dedicated tuner to a PIG generator provides additional advantages.

SUMMARY OF THE INVENTION

A display generator feeds drive signals to the output synchronized to the television monitor. EPG information is extracted from the television signal and stored in memory. The number of pixels used to represent the television signal is reduced. The reduced number of pixels television signal is stored in memory. The EPG data and the television signal are retrieved from memory and stored in the display generator. The EPG data and the television signal are fed from the display generator to the output in a continuous data stream ordered to produce a picture-in-guide display on the monitor. The picture-in-guide generator is implemented on a single integrated circuit chip along with the circuitry generating the graphics.

The addition of a dedicated tuner to the PIG generator chip allows the PIG generator to capture VBI data at any time whether the viewer is watching the television or not. This greatly improves the ability of the PIG generator to provide real-time data services. The additional tuner also improves the PIG display by allowing a main tuner, such as the television tuner, to stay on one channel. This eliminates on-screen display (OSD) "bounce" as the main tuner provides horizontal and vertical synchronization (HSYNC and VSYNC) signals that become unstable during channel changes. An alternative solution to the OSD bounce problem is for the PIG generator to include a function that will generate stable HSYNC and VSYNC at all times such as a pseudo-sync generator. However, the drawback is that an addition of a pseudo-sync generator would require additional work by a television manufacturer, for example, to incorporate pseudo-sync generator capabilities into an existing television chassis.

In one aspect of the invention, a picture-in-guide generator apparatus includes a digital tuner provided on a single chip. The digital tuner is configured to receive a television signal and to tune the television signal received to a specific channel. The picture-in-guide generator apparatus also includes a video interface configured to receive a television signal tuned to a specific channel and a tuner selector coupled to the digital tuner and the video interface and configured to determine status of the video interface and the digital tuner. The tuner selector

outputs one of the television signals received by the digital tuner and the video interface based on the determined status. The display controller is also included and is configured to reduce pixel size of the television signal outputted by the tuner selector and to extract electronic program guide information from the outputted television signal. Furthermore, the picture-in-guide generator includes a memory storing the extracted program guide information and the reduced pixel size television signal and a display generator retrieving the electronic program guide information and the television signal and supplying signals to a television monitor in an ordered continuous data stream to produce a picture-in-guide display on the television monitor.

Many of the attendant features of this invention will be more readily appreciated as this picture-in-guide generator apparatus becomes better understood by references to the following detailed description considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of specific embodiments of the best mode contemplated of carrying out the invention are illustrated in the drawings, in which:

FIG. 1 illustrates a program guide display in a picture-in-guide (PIG) format;

FIG. 2 is a schematic of a PIG generator according to one embodiment of the invention;

FIG. 3 is a schematic of the organization of data in RAM according to one embodiment of the invention;

FIG. 4 is a block diagram of one embodiment of the invention combined with a full-screen video display system;

FIG. 5 is a flow diagram of a process of the host tuner operating with a PIG generator; and

FIG. 6 is a flow diagram of a process of an auxiliary tuner with a host tuner in a television operating with a PIG generator.

DETAILED DESCRIPTION

According to the invention, a picture-in-graphics (PIG) generator is provided for producing a PIG display on a television screen or computer monitor. There are generally three display types available in a television system using a PIG generator. The first type is a full-screen video display comprising a real-time image of a broadcast television program. The second type, a PIG display, includes background graphics and a real-time video image in a small inset window. The third type of display is a full-screen graphics display.

FIG. 1 illustrates a PIG display 10 of an electronic program guide (EPG) comprising a graphics portion 12 and a picture window 14. The picture window 14, hereafter referred to as the PIG window, contains a video image of the television program displayed in the full-screen video display, but in reduced size, generally reduced by a factor of three in both width and height, i.e., 1/9 the size of the screen.

The graphics portion 12 of the PIG display 10 takes up a majority of the screen. The graphics portion generally includes text, icons, and background graphics of several different colors. The graphics may include highlighting of text or sections of the screen. In an EPG system, the viewer can generally navigate through different guides without changing the television program displayed in the PIG window 14. In some EPG systems, when the viewer places a cursor 16 on a different channel designation 18 or program title 20 in the graphics portion, the system automatically tunes the associated digital tuner 50, if available, or the host's tuner to the selected channel and displays the program broadcast on that channel in the PIG window 14.

The components necessary in the present invention to generate a PIG display 10 are provided on a single chip to be incorporated into televisions, VCR's, stand-alone units, satellite receivers or the like. By providing all the components on a single chip, the overall package size can be reduced as well as the overall gate count and bus interface size of that chip.

FIG. 2 is a schematic of the components of the present invention provided on a single chip 21. These include a microprocessor 22, a memory controller or direct memory access (DMA) device 24, synchronization regenerating (synch) circuitry 28, analog-to-digital conversion (ADC) 30c, automatic gain control circuitry (AGC) 30b, DC clamp circuitry 30a, a PIG window generator 32, a display generator 34, a color space converter 60 digital-to-analog conversion (DAC) circuitry 36, pixel clock 38, NTSC decoder 52, and VBI slicer ZZ.

The microprocessor 22 is relatively slow compared to the video processing hardware, e.g., the PIG window generator 32 and the display generator 34. The microprocessor 22 organizes data storage in the RAM 26 and can assign addresses for both text data and video data. Preferably, there is only one RAM 26. The RAM 26 is accessed by four different components: the microprocessor 22, the PIG window generator 32, the display generator 34 and the VBI slicer ZZ. This places a high access load on the RAM as all four components may vie for access to the RAM simultaneously. However, only one sample of so many bits may be accessed per cycle. A multiplexing device is used to resolve the arbitration between the components. Accordingly, the microprocessor 22, PIG window generator 32, the display generator 34, and the VBI slicer ZZ each access the RAM 26 through the DMA 24. The DMA 24 is a multiplexing and arbitrating circuit that facilitates sharing of the RAM 26 by switching access between the four components in turn. The DMA 24 includes buffer memories to temporarily store data input from out-of-turn components between access cycles. The DMA 24 stores text and video data in the correct address in the RAM 26 and then retrieves the appropriate data from a selected address from the RAM 26 when needed.

The system also receives a video signal from the digital tuner 50. Otherwise, it receives a video signal from the host YY. The digital tuner is a National Television Standards Committee (NTSC) tuner implemented in digital circuitry as opposed to analog circuitry. One such example of a digital tuner is a NTSC tuner created as an integrated single chip and is disclosed by US

Patent No. 5,737,035 issued to Rotzoll, the disclosure of which is incorporated herein by reference. The digital tuner 50 provides a separate data source for an EPG System for data such as VBI data or video signals.

Conventional EPG systems rely upon the NTSC tuner available in the host system, the host system being either a TV or a VCR. In a dual-tuner host, a host system having two NTSC tuners, the EPG system can collect EPG and related data while the viewer is watching the television. In a single-tuner host, a host system having only one NTSC tuner, the EPG system can only collect information when the host system is off. The dependence on the NTSC tuner of the host system restricts the timeliness and hence the quality of the information provided by the EPG.

In a single-tuner host, the NTSC tuner which is part of the television or VCR provides the video signals to display the television program in a conventionally full-screen format. The digital tuner 50 independently supplies the video signals to the PIG generator 32 to present the PIG display. As a result, the PIG generator always has an available data source, whether the host system is on or off or if the NTSC tuner of the host system is otherwise occupied. Therefore, the availability of an independent NTSC tuner, i.e. the digital tuner 50, completely under the control of the EPG ensures that timely data is provided to the EPG. This further enables real-time services containing real-time or constantly updated data, such as weather or stock reports, to be provided and used by the PIG generator without disruption of the services being provided by the host system.

Furthermore, the digital tuner 50 is of a lower quality and cost than a typical NTSC tuner of a host system. Hence, the digital tuner 50 in the PIG generator provides a low-cost and effective picture-in-picture (PIP) tuner for a TV or a VCR not otherwise equipped. This can prove to be advantageous to manufacturers of TVs and VCRs that want to provide PIP functionality or a secondary tuner but are prohibited by cost concerns.

FIG. 4 is a simplified block diagram of one such implementation. Tuner 301 is part of the host system and digital tuner 303 is the tuner coupled with the PIG generator of the present invention. Both tuners 301 and 303 provide independent video signal to a tuner selector 305. The tuner selector 305 selects the video source for the PIP/PIG display that will be created by the PIG Generator system 350. Since the digital tuner 303 is less expensive and generally lower quality than the tuner 301, the digital tuner 303 would not usually be used as a main picture source. The PIG generation system 350 extracts EPG data from the video signal and reduces the picture size and stores the resultant text and video data in the EPG memory 309. If a digital tuner is available to the system, then the EPG system tunes the digital tuner 303; extracts EPG data; and stores the data in EPG memory 309 anytime that the EPG is not on-screen.

FIG. 5 illustrates an overview of the host tuner operating with the PIG system. In step 411, the process determines the state of host system. In one embodiment, the state of the host system is determined by examining a series of electrical control lines such that when one or more

control lines have a "logical 1", the host system is powered on. Alternatively, a signal detector determines the state of the host by examining the television signals supplied by a tuner of the host system to the PIG system. When no television signals supplied by the host system is detected, the host system is powered off. In another embodiment, the state of the host system is determined by a monitor program (implemented in software, hardware, or both) that transmits commands to a similarly enabled host system and receives responses from the host system. Based on the commands sent and the responses received, the state of the host system is determined by the monitor program. For example, if the monitor program sends a power on status command to the host system and no response is received within a predetermined amount of time, the host system is determined to be powered off. However, if the monitor program sends a power on status command to the host system and a successful response is sent from the host system, then the host system is determined to be powered on.

If the host system is powered on, as determined in step 413, then the EPG does not extract data. If the host system is not powered on, as determined in step 413, then in step 419 the host tuner is tuned to a data channel to receive the television signal containing data. In step 417, the data is extracted and, in step 421, the data is sent to the EPG memory.

Referring back to FIG. 4, it is preferable that the tuner 301 provides the video source for the full-screen video display that is feed from the tuner selector 305 to a display-type selector 307 which supplies full-screen video images to a display 310. Similarly, the PIG generator system 350 provides the PIG display to the display-type selector 307 which provides the images to the display 310.

FIG. 6 illustrates an overview process of the host tuner in a television operating in conjunction with the digital tuner acting as an auxiliary tuner. In step 451, the process determines the state of television, similar to step 411 illustrated in FIG. 5, by examining control lines or using a monitor program. If the television is powered on, as determined in step 453, then the process determines in step 455, if the television is in full screen mode. Full screen mode means that the television handles full screen television images, i.e. a real-time video image of a tuned television program displayed on the entire television display. If the television is in full screen mode, then the host tuner in the television continues to handle the full screen television images for the television display in step 461. Also, the auxiliary tuner is tuned to a data channel to receive the television signal and extracted data is routed to the EPG memory (step 463).

If the television is not in full screen mode, then the host tuner in the television is tuned to a data channel to receive the television signal and extracted data is routed to the EPG memory (step 457). In step 459, the auxiliary tuner handles the television images for the television display, in one embodiment, for a PIG display to include a real-time video image of a tuned television program displayed in a small window inset in the larger graphic guide. However, if the host system is not powered on, as determined in step 453, then the process connects a pre-assigned tuner, the auxiliary or host tuner, to handle the EPG data and the other tuner to handle

the television images for the television display. In one embodiment, the pre-assigned tuner is the auxiliary tuner, the digital tuner, to handle the EPG data. In this embodiment, the digital tuner being of lower quality then the host tuner is pre-assigned to handle the EPG data with the television off to ensure that the host tuner is immediately available to handle the full screen television images for the television display when the television is powered on.

Referring back to FIG. 2, horizontal and vertical (h- and v-) synchronization signals are split from the video signal provided by the host tuner and routed to the synch circuitry 28. The hsync and vsync signals extracted from the conventional video baseband signal (CVBS) is used in video decimation by the PIG window generator. The synch circuitry 28 is coupled to a pixel clock 38. The pixel clock determines the x- and y-coordinates of each pixel to be displayed on the screen. The y-coordinate corresponds to the scan line number of the screen, and the x-coordinate corresponds to the pixel number in each scan line.

The video portion of the input video from the digital tuner 50 is processed from a 45MHz intermediate frequency (I/F) signal to a CVBS by a demodulator XX. The CVBS signal is converted into a stream of digital samples by the analog to digital converter (ADC) 30c. The CVBS signal is first processed by the DC clamp 30a and automatic gain control 30b to reduce distortion in the signal due to, for example, low frequency noise and dc bounce when switching the signal.

The NTSC decoder 52 converts the digital sample stream to digital YUV video signals corresponding to a full screen video image. The PIG window generator 32 receives the digital YUV video signals and reduces the overall picture size by decimating the video data before sending it to the DMA 24 for storage in the video data section 33 of the RAM 26. To decimate the video data, the PIG window generator 32, in cooperation with the synch circuitry 28, selects, for example, one out of every three pixels and one out of every three scan lines, i.e., a 1:3 ratio, and then sends this data to the DMA 24 for storage in RAM 26. Other decimation ratios are possible., e.g., 1:4, in order to generate different sized PIG windows.

The correct address for storing the video data from PIG window generator 32 in the RAM 26 is determined by address mapping circuitry 40 which is preferably incorporated into the DMA 24. Using the synch signal from the synch circuitry 28 and the pixel clock 38, the address mapping circuitry 40 stores video data corresponding to each pixel on the CRT in an appropriate address site in the RAM for later access for display. This process is generally referred to as "bit mapping."

The display generator 34 includes a graphics generator which formats fonts for the text to be displayed, icons, color and highlighting, and background graphics for the graphics portion 12 of the PIG display 10. The graphics data is routed to the address mapping circuitry 40 which, in cooperation with the DMA 24, stores the video data in address sites in the RAM 26 corresponding to pixel coordinates on the screen.

Generation of the PIG display 10 (FIG. 1) according to an embodiment of the present invention in FIG. 2 will now be explained.

In response to a viewer command device, e.g., an IR remote, for a given PIG display, the microprocessor 22 accesses the appropriate text data for that display from the raw text data 31 in the RAM 26 in FIG. 3. The microprocessor 22 configures the text data for display and routes the text data, with appropriate addresses for display of the text, to the DMA 24 for storage as video data 33 in the RAM 26.

All video data for generating the PIG display 10, including the text and graphics of the graphics portion 12, and the video image of the PIG window 14, is stored as video data 33 in the RAM 26 as described above. The display generator 34, in cooperation with the address mapping circuitry 40 and synch circuitry 28, accesses the pre-organized contents of the video data 33 in the RAM 26 to create an image for display on the screen of the CRT 62. The data for each pixel to be displayed on the screen is stored as video data 33 in the RAM 26 with an address corresponding to the x- and y-coordinate of that pixel on the screen. The display generator 34 accesses the appropriate data from the RAM 26 for each pixel in sequence as determined by the pixel clock 38 and synchronization for pixel output uses the h- and v-synch signals from the host tuner.

Although it is preferable to store the entire screen field or frame in RAM 26 at one time in a bit mapped fashion, less than the entire screen, i.e., only part of the screen, could be stored at one time and the display processing could in effect be executed in pixel groups that are smaller than the entire screen.

The display generator 34 outputs digital YUV signals. The color space converter 60 digitally converts the YUV signals to digital RGB signals. The DAC circuitry converts the digital RGB to analog RGB signals for display on the screen of the CRT 62.

In an alternative embodiment of the invention, RAM 26 is located "off chip" where it is connected by a data bus to DMA 24. RGB converter 60, CRT 62, and viewer commands 70 are part of the television apparatus. In other words, these components serve the dual function of helping to display the television signal in conventionally in a full screen format and to display the picture-in-guide format. The other components are unique to the picture-in-guide format.

The design of the PIG circuitry according to the present invention on a single chip 21 provides a more economical package with a reduced size and gate count. The invention reduces overall gate count by requiring only a single gate array for each of the microprocessor 22, synch circuitry 28, DAC circuitry 36, digital tuner 50 and DMA 24, instead of two gate arrays for each of these components on separate PIP and EPG chips as used in known television systems to generate a PIG display. It should also be noted that display generator 34 feeds both picture information and EPG information to CRT 62 under the control of pixel clock 38 and synch circuitry 28 in a continuous stream of data. Thus, a video (i.e., moving picture) image is created in an EPG display without a high speed switch.

The described embodiment of the invention is only considered to be preferred and illustrative of the inventive concept; the scope of the invention is not to be restricted to such embodiment. Various and numerous other arrangements may be devised by one skilled in the art without departing from the spirit and scope of this invention. For example, separate RAM's could be used to store the EPG data and the reduced size television signal. Further, the invention could be used in a digital television transmission system as well, in which case the ADC, DAC, and VBI slicer could be eliminated.

CLAIMS

1. A picture-in-guide generator system for use with a television monitor, the picture-in-guide generator system comprising:

a digital tuner provided on a single chip and configured to receive a television signal and to tune the television signal received to a specific channel;

a video interface configured to receive a television signal tuned to a specific channel;

a tuner selector coupled to the digital tuner and the video interface and configured to determine status of the video interface and the digital tuner, the tuner selector outputs one of the television signals received by the digital tuner and the video interface based on the determined status;

display controller configured to reduce pixel size of the television signal outputted by the tuner selector and to extract electronic program guide information from the outputted television signal;

a memory storing the extracted program guide information and the reduced pixel size television signal; and

a display generator retrieving the electronic program guide information and the television signal and supplying signals to a television monitor in an ordered continuous data stream to produce a picture-in-guide display on the television monitor.

2. The picture-in-guide generator apparatus of claim 1 wherein the display controller includes a VBI slicer configured to extract electronic program guide information from the television signal outputted by the video select box;

3. The picture-in-guide generator apparatus of claim 1 wherein the digital tuner, the video interface, the tuner selector, the display controller and the display generator are implemented on a single chip.

4. The picture-in-guide generator apparatus of claim 1 wherein the tuner selector outputs the television signals received by the digital tuner based on the status of the video interface being off, such that no television signal tuned to a specific channel is received by the video interface.

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5. A method of providing a picture-in-guide display on a television monitor using a picture-in-guide generator, the method comprising:

receiving a first television signal by a digital tuner;

tuning the first television signal received to a specific channel by the digital tuner;

determining status of one of the digital tuner and a video interface, the video interface configured to receive a second television signal tuned to a specific channel;

selectively outputting one of the first and second television signals based on the determined status;

reducing pixel size of the outputted television signal;

extract electronic program guide information from the outputted television signal;

storing the extracted program guide information and the reduced pixel size television signal;

retrieving the electronic program guide information and the reduced pixel size television signal; and

supplying signals to a television monitor in an ordered continuous data stream to produce a picture-in-guide display on the television monitor.

6. The method of claim 5 wherein the status of the video interface is off when the second television signal tuned to a specific channel by a video interface is not received.

7. The method of claim 6 wherein the first television signal is selectively outputted when the status of the video interface is off.

8. A method of providing a picture-in-guide display on a television monitor in combination with a host video system, the method comprising:

determining mode of a host video system;

tuning the host video system to receive a first television signal for a specific channel based on the mode of the host video system;

extracting electronic program guide information from the received television signal;

storing electronic program information in memory; and

retrieving the stored electronic program information to display a picture-in-guide display.

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9. The method of claim 8 further comprising:

receiving a television signal;

reducing the pixel size of the television signal;

storing the reduced pixel size television signal in the memory;

retrieving the electronic program guide information and the television signal from the memory;

storing the retrieved electronic program guide information and the television signal in the display generator; and

supplying the electronic program guide information and the television signal from the display generator to an output adapted to drive a television monitor in a continuous data stream ordered to produce a picture-in-guide display on the television monitor.

10. The method of claim 9 wherein the host video system is a television monitor, the television monitor including a full screen mode and a picture-in-picture mode.

11. The method of claim 10 further comprising:

connecting the tuner of the host system to the television monitor when the television monitor is in full screen mode; and

connecting an auxiliary tuner to a display controller, such that electronic program guide information is extracted and stored in the memory.

12. The method of claim 10 further comprising:

connecting the tuner of the host system to a display controller when the television monitor is in picture-in-picture mode, such that electronic program guide information is extracted and stored in the memory; and

connecting an auxiliary tuner to the television monitor.

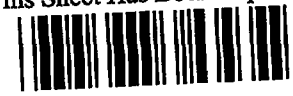
13. The method of claim 10 further comprising:

assigning one of the tuner of the host system or an auxiliary tuner to be connected to a display controller; and

connecting the assigned tuner to the display controller, such that electronic program guide information is extracted and stored in the memory .

14. The method of claim 11 wherein the auxiliary tuner is a digital tuner provided on a single chip.

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15. A picture-in-guide generator apparatus for use with a television monitor and a host video system, the picture-in-guide generator apparatus comprising:

a digital tuner provided on a single chip and configured to receive a first television signal and to tune the television signal received to a specific channel;

a host video system configured to receive a second television signal and to tune the second television signal received to a specific channel;

a tuner selector coupled to the digital tuner and the host video system and configured to determine status of the video interface and the digital tuner, the tuner selector outputs one of the television signals received by the digital tuner and the video interface based on the determined status;

display controller configured to reduce pixel size of the television signal outputted by the tuner selector and to extract electronic program guide information from the outputted television signal;

a memory storing the extracted program guide information and the reduced pixel size television signal; and

a display generator retrieving the electronic program guide information and the television signal supplying signals in an ordered continuous data stream to produce a picture-in-guide display.

16. The picture-in-guide generator apparatus of claim 15 further comprising a display-type selector configured to receive signals from the display generator and to supply the received signals to a television monitor to produce a picture-in-guide display on the television monitor.

17. The picture-in-guide generator apparatus of claim 15 further comprising a display-type selector configured to receive signals from the host video system and to supply the received signals to a television monitor to produce a full screen display on the television monitor.

18. The picture-in-guide generator apparatus of claim 15 further comprising a display-type selector configured to receive signals from the display generator and to receive signals from the host video system and to selectively supply the received signals to a television monitor to produce one of a picture-in-guide display or a full screen display on the television monitor.

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19. A method of providing a picture-in-guide display on a television monitor using a picture-in-guide generator with a host video system, the method comprising:

receiving a television signal by a digital tuner;

tuning the television signal received to a specific channel by the digital tuner;

receiving the television signal tuned to a specific channel and provided by a host video system;

extracting synchronization signals from the received television signal tuned to a specific channel and provided by the host video system;

reducing pixel size of the received television signal from the digital tuner;

extract electronic program guide information from the received television signal from the digital tuner;

storing the extracted program guide information and the reduced pixel size television signal;

retrieving the electronic program guide information and the reduced pixel size television signal; and

supplying signals to a television monitor in an ordered continuous data stream to produce a picture-in-guide display on the television monitor.

