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(54) **BACKWARDS COMPATIBLE REAL-TIME PROGRAM GUIDE CAPACITY INCREASE**

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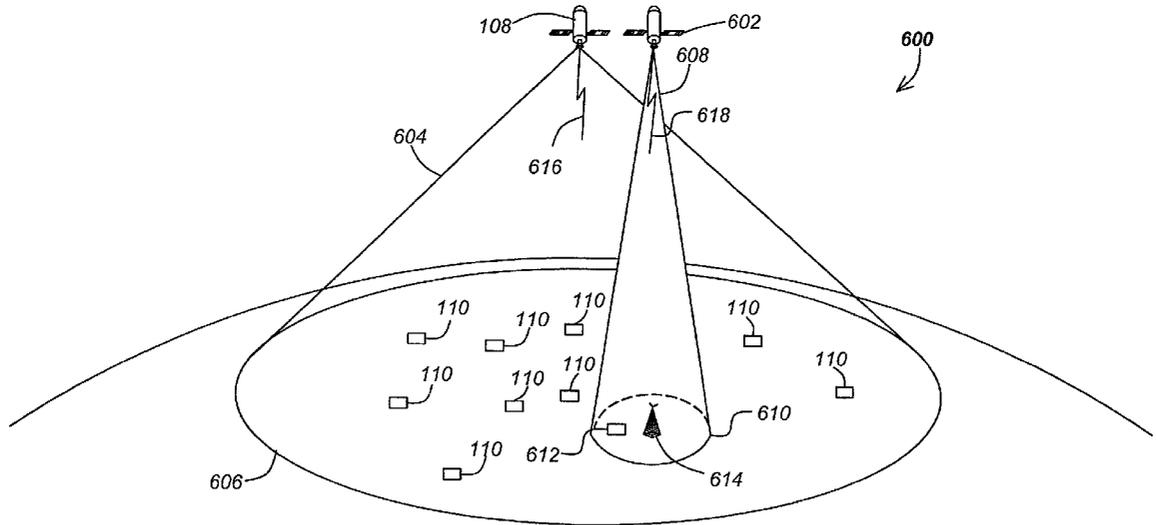
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(57) **ABSTRACT**

A system and method for transmitting program guide information describing a second set of programs to subscribers is disclosed. In one embodiment, the method is implemented in a network broadcasting a first signal having a first set of programs and a second signal having a second set of programs. The method comprises the steps of broadcasting first program guide information describing the first set of programs to the subscribers on a first service channel on a first signal and broadcasting second program guide information describing the second set of programs to a subset of the subscribers on the first service channel on a second signal, wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal. In another embodiment, the method comprises the steps of receiving first program guide information describing the first set of programs on a first service channel on a first signal; and receiving second program guide information describing the second set of programs on the first service channel on a second signal, wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal.
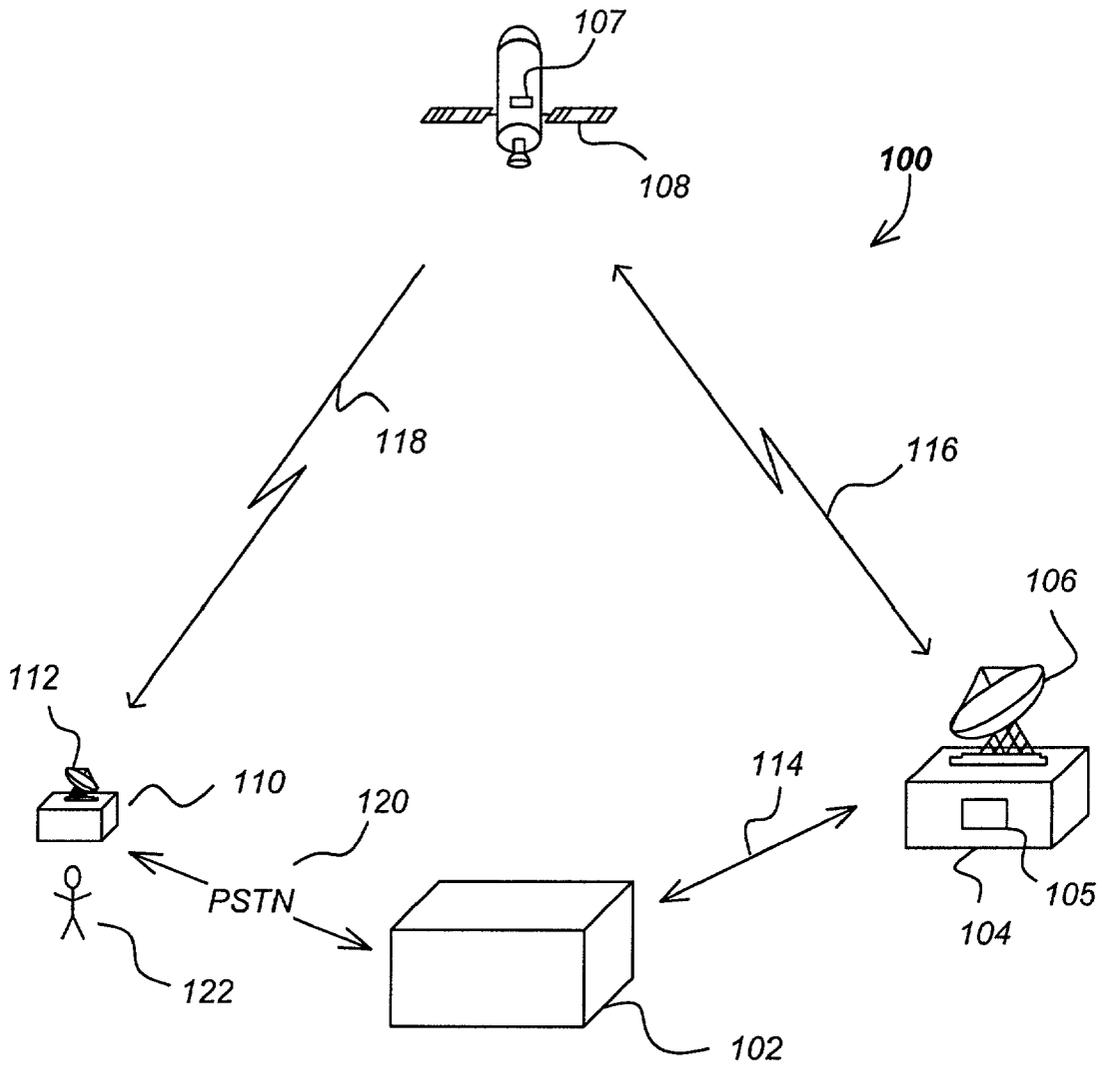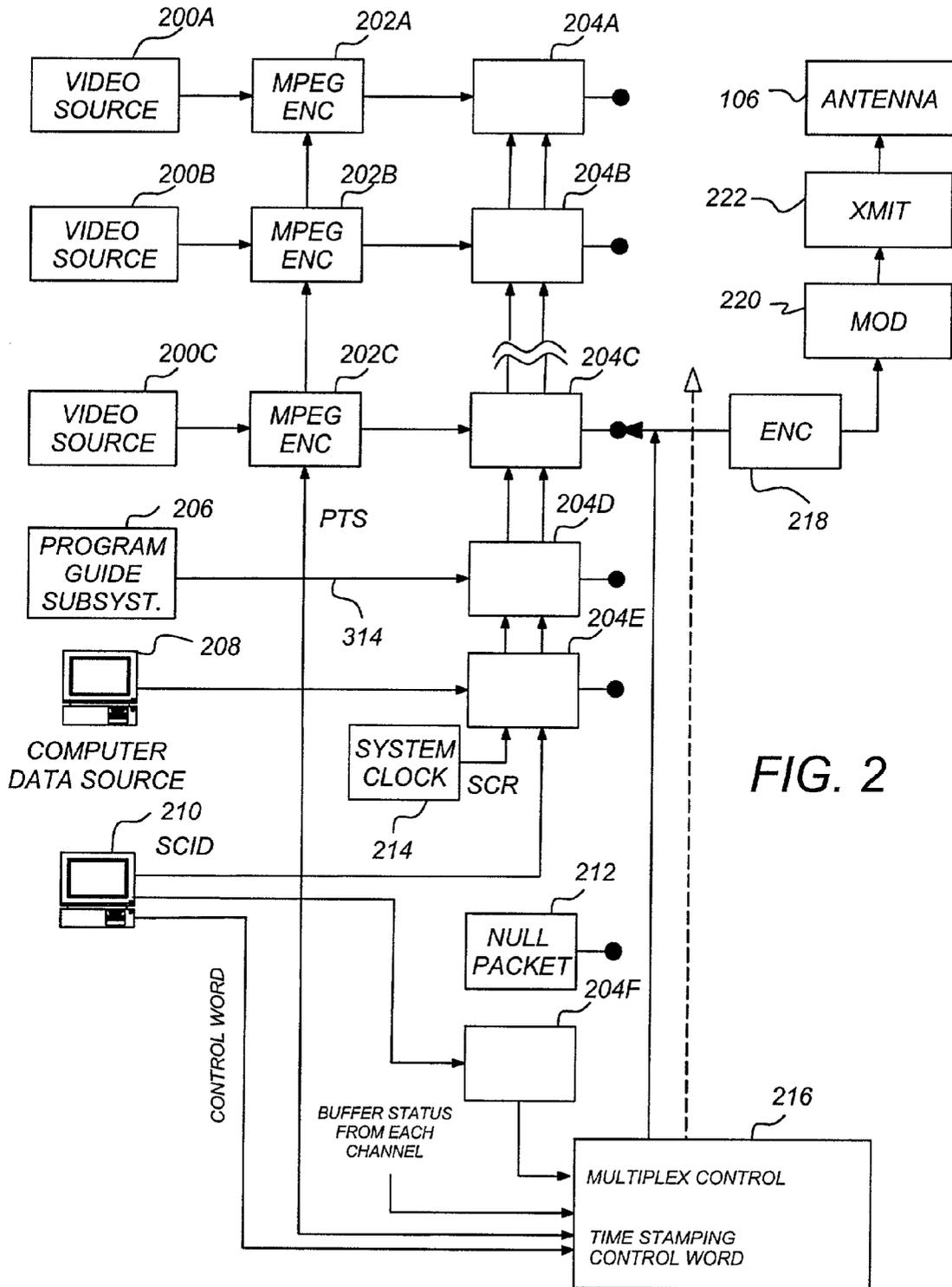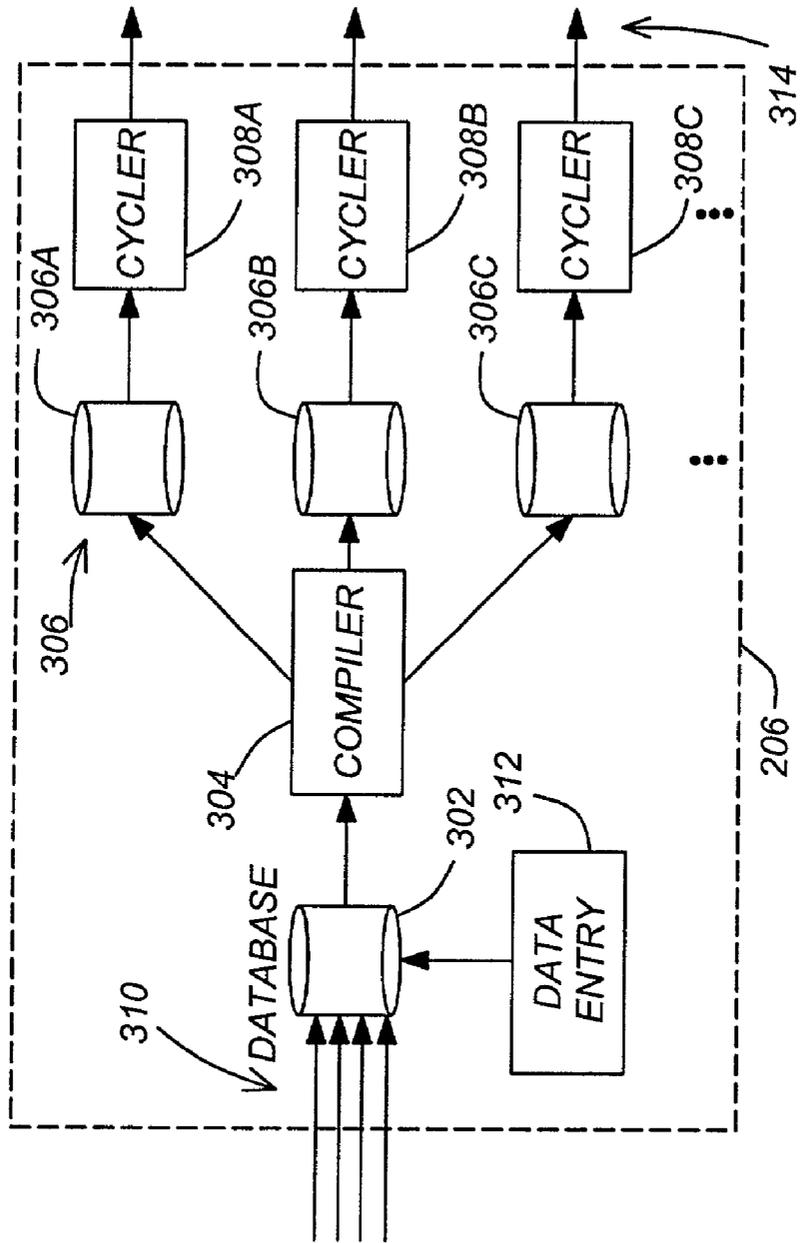
FIG. 1

FIG. 2

FIG. 3

VIDEO CH 1	DATA	VIDEO CH 5	PRO. GUID.	NULL	AUDIO CH1	VIDEO CH 1	AUDIO CH 2

402   404   406   408   410   412   414   416

FIG. 4A

SCID & FLAGS 420	PACKET TYPE & CONTINUITY COUNTER 422	PAYLOAD	FEC

424   426

FIG. 4B

FIG. 5

FIG. 6

700
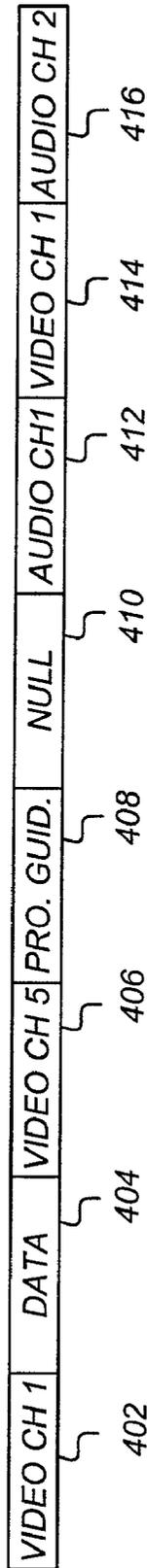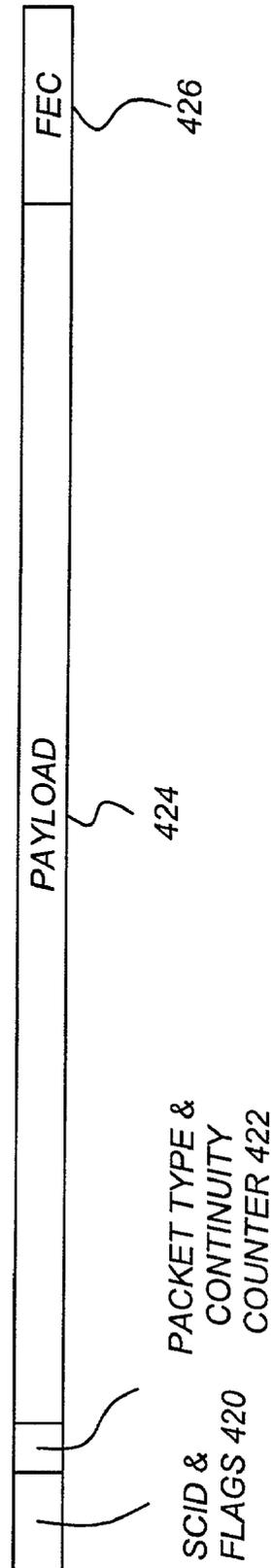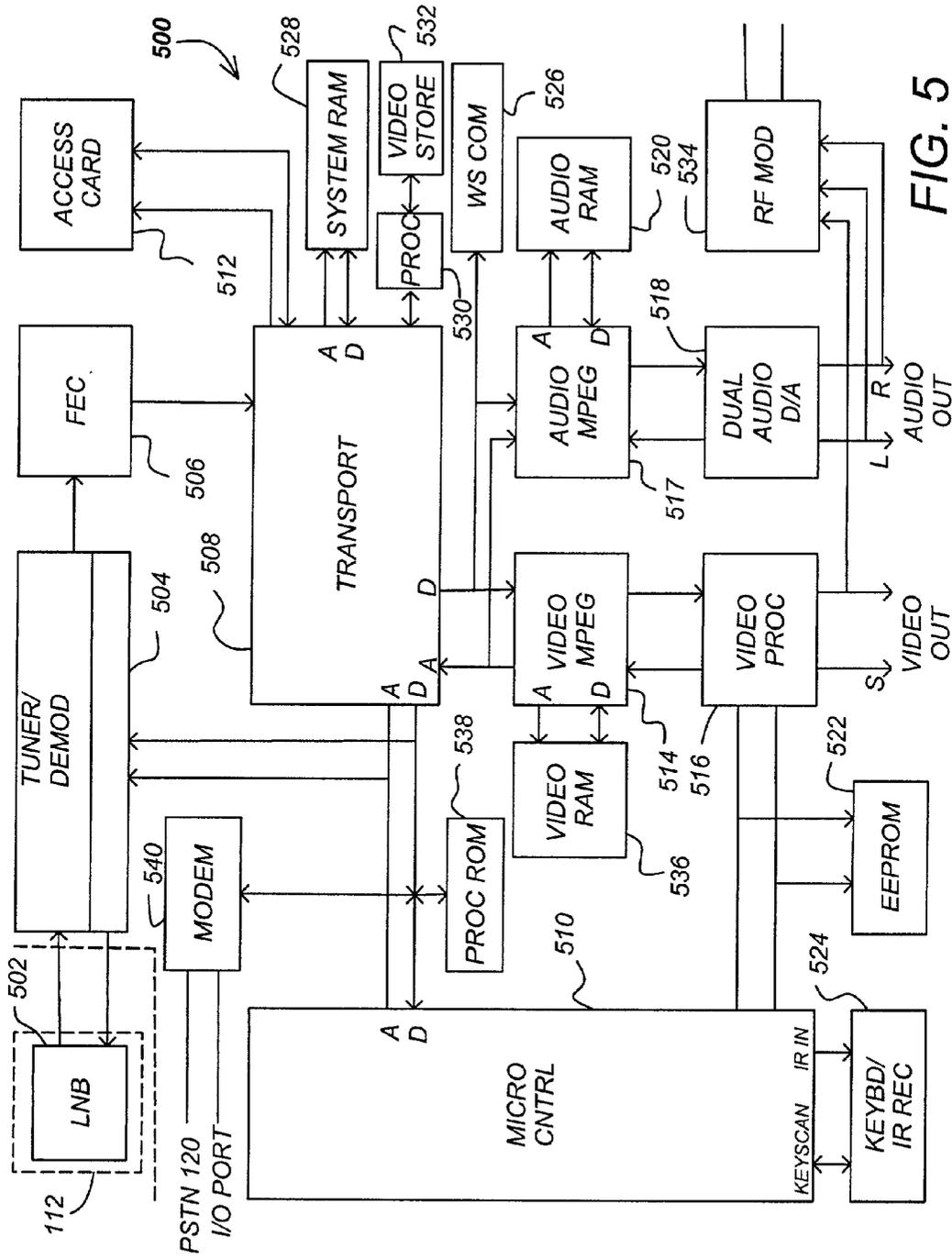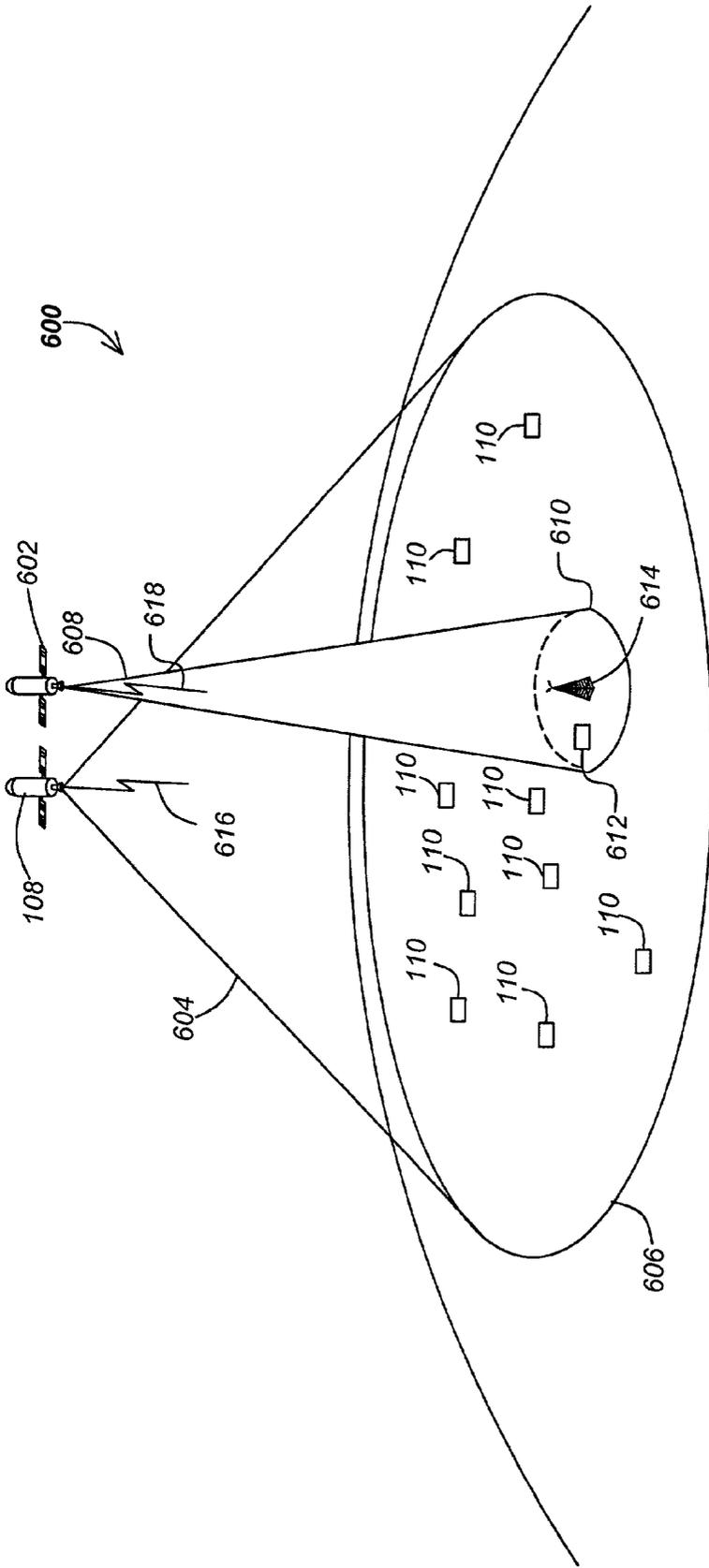
CONUS MPG CONTENT		SPOT BEAM MPG CONTENT	
SIGNAL/SCID	DESCRIPTION	SIGNAL/SCID	DESCRIPTION
FIRST /10	PROGRAM 1	FIRST /10	PROGRAM 1
.	PROGRAM 2	.	PROGRAM 2
.	PROGRAM 3	.	PROGRAM 3
	PROGRAM 4		PROGRAM 4
FIRST 0X499	PROGRAM N	FIRST 0X499	PROGRAM N
SECOND 0X49A	PROGRAM N+1	SECOND 0X49A	LOCAL PROGRAM 1
.	PROGRAM N+2	.	.
.	PROGRAM N+3	.	.
SECOND/0X4FF	PROGRAM M	SECOND/0X4FF	LOCAL PROGRAM 101
.	.		
.	.		
.	.		

704   706   716   718   720   722

FIG. 7

712

Ch	NETWORK	8:00 PM	8:30 PM	9:00 PM
01	HBO	Backdraft	Backdraft	Titanic
02	TBS	Live!	Live!	Live!
03	HISTORY CHANNEL	Hitler's Lost Wine Cellar	Hitler's Lost Wine Cellar	Hitler's Lost Wine Cellar
04	DISCOVER	The Owens Valley	The Owens Valley	The Owens Valley
.	.			
.	.			
.	.			
899	BET	News	The Wiz	The Wiz
900	LOCAL CHANNEL 1	Select for More Info		
901	LOCAL CHANNEL 2	Select for More Info		
902	LOCAL CHANNEL 3	Select for More Info		
903	LOCAL CHANNEL 4	Select for More Info		
.	.			
.	.			
.	.			
1000	LOCAL CHANNEL 101	Select for More Info		

802   804   806A   806B   806C

810   812   814   816A   816B   816C

FIG. 8

Ch	NETWORK	8:00 PM	8:30 PM	9:00 PM
01	HBO	Backdraft	Backdraft	Titanic
02	TBS	Live!	Live!	Live!
03	HISTORY CHANNEL	Hitler's Lost Wine Cellar	Hitler's Lost Wine Cellar	Hitler's Lost Wine Cellar
04	DISCOVER	The Owens Valley	The Owens Valley	The Owens Valley
.	.			
.	.			
.	.			
899	BET	News	The Wiz	The Wiz
900	KCBS 2	Live it Up	Disappointment Alley	Recovery City
901	KNBC 4	Bicycling Today	Travelog - Utah	Working Out
902	KABC 7	Teens in Trouble	Teens in Trouble	More Teens in Trouble
903	KCOP 9	COPS	COPS	LAPD
.	.			
.	.			
.	.			
1000	KDOC 56	Perry Mason	Perry Mason	The Rockford Files

714

FIG. 9

START

BROADCAST FIRST PROGRAM GUIDE
INFORMATION DESCRIBING A FIRST SET OF
PROGRAMS TO THE SUBSCRIBERS ON A FIRST
SERVICE CHANNEL ON A FIRST SIGNAL   1002

BROADCAST SECOND PROGRAM GUIDE
INFORMATION DESCRIBING THE SECOND SET
OF PROGRAMS TO A SUBSET OF THE
SUBSCRIBERS ON A SECOND SERVICE
CHANNEL ON A SECOND SIGNAL   1004

END

FIG. 10

START

RECEIVING FIRST PROGRAM GUIDE INFORMATION DESCRIBING A FIRST SET OF PROGRAMS ON A FIRST SERVICE CHANNEL ON A FIRST SIGNAL — *1102*

ACCEPT A SELECTION OF AT LEAST ONE OF THE SURROGATE CHANNELS IN A RECEIVER — *1104*

TUNING THE RECEIVER TO RECEIVE THE FIRST SERVICE CHANNEL ON A SECOND SIGNAL — *1106*

RECEIVING SECOND PROGRAM GUIDE INFORMATION DESCRIBING THE SECOND SET OF PROGRAMS ON THE FIRST SERVICE CHANNEL ON THE SECOND SIGNAL — *1108*

END

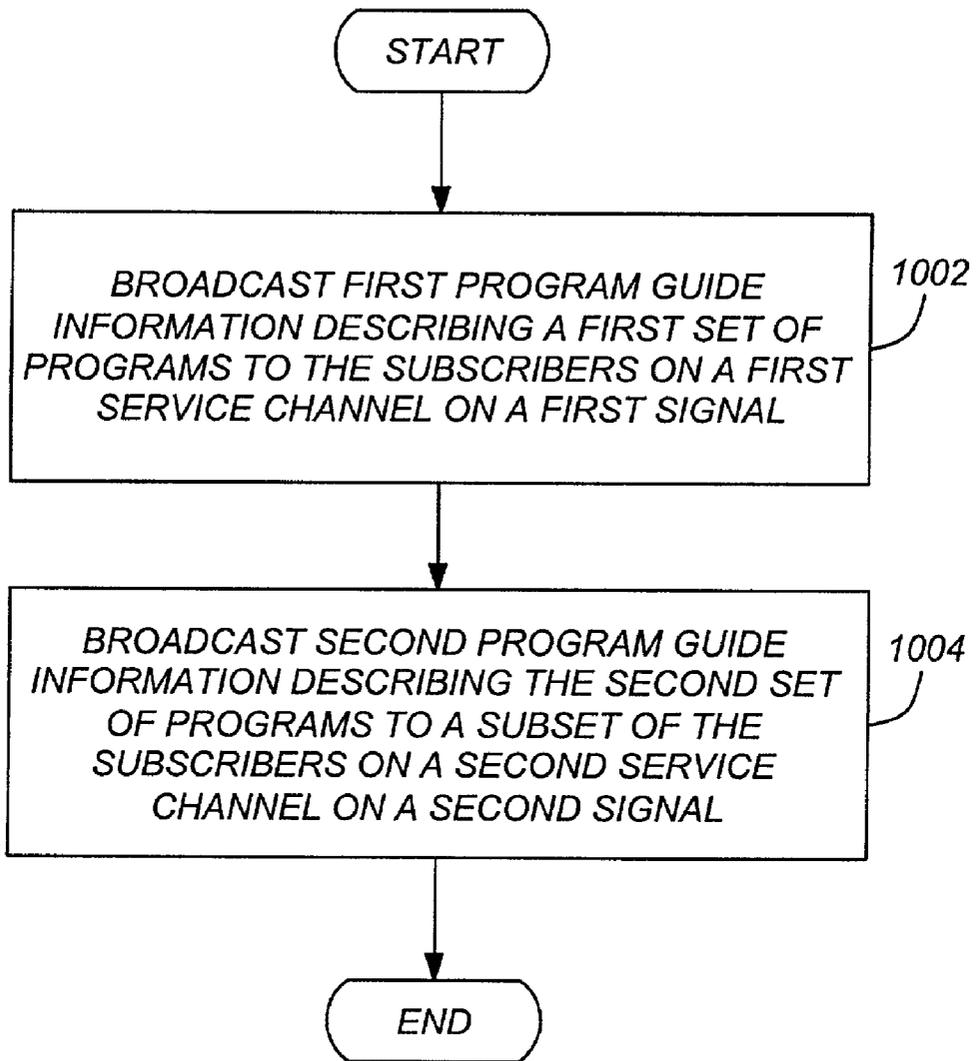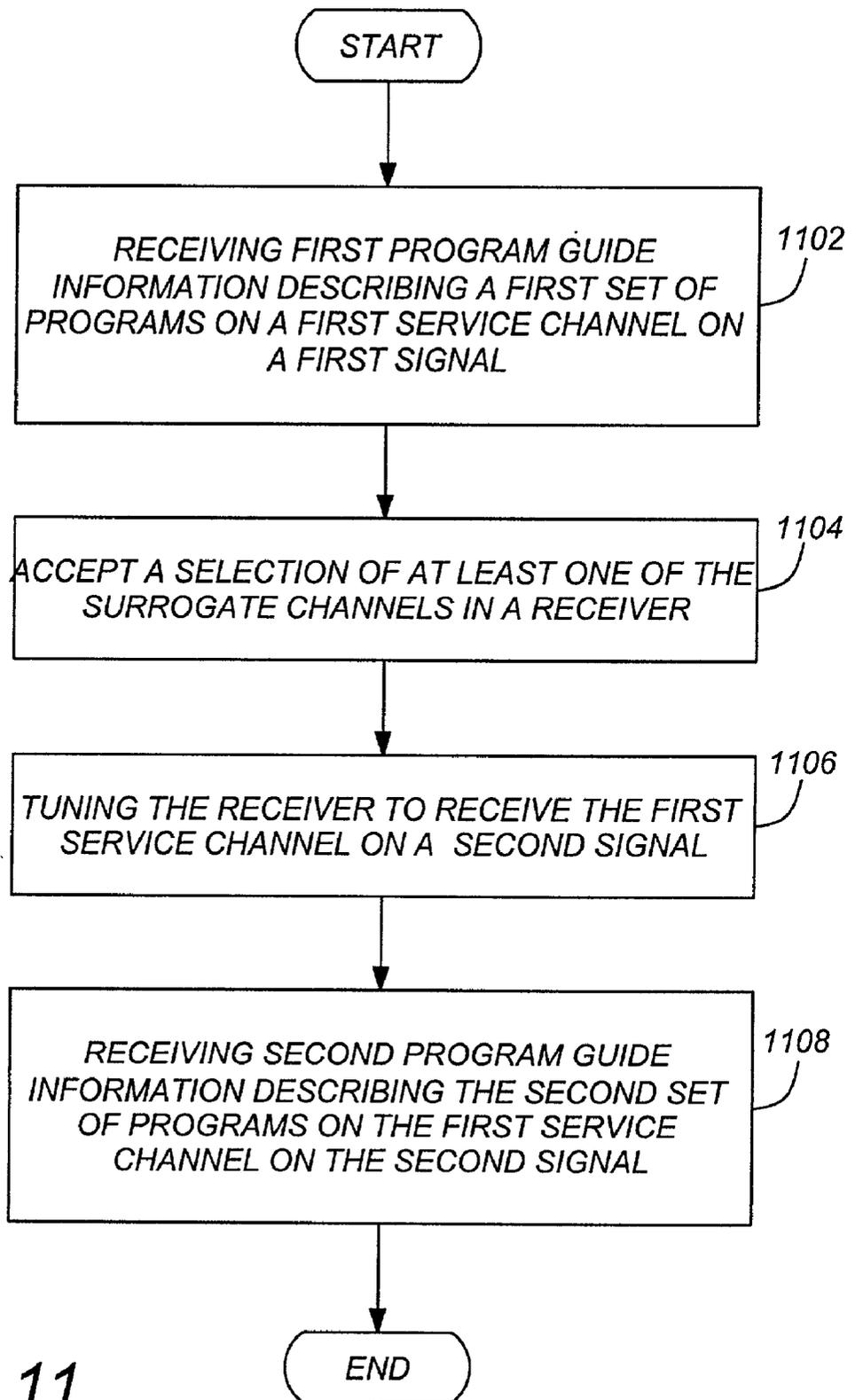*FIG. 11*

BACKWARDS COMPATIBLE REAL-TIME PROGRAM GUIDE CAPACITY INCREASE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to systems and methods for providing video program material to subscribers, and in particular to a method and system for providing program guides with increased capacity to accommodate descriptions of local channel content.

[0003] 2. Description of the Related Art

[0004] Television programs are distributed to viewers by a variety of broadcasting methods. These methods include traditional analog broadcast television (National Television Systems Committee or "NTSC" standard), the upcoming digital broadcast television (Advanced Television Systems Committee or "ATSC" standard), cable television (both analog and digital), satellite broadcasting (both analog and digital), as well as other methods. These methods allow channels of television content to be multiplexed and transmitted over a common transmission medium.

[0005] In recent years, there has been an increasing demand for video distribution systems to provide more program channels. In digital satellite systems, this may be accomplished in many ways. One way of increasing the number of available channels is to increase the compression or decrease the error correction provided in the broadcast signal of existing satellites. Another way of increasing the number of available channels is to increase the bandwidth of the downlink from the satellite to the subscribers' receivers. Unfortunately, this technique is difficult to accomplish with existing (legacy) satellites and in a way that is compatible with existing (legacy) receivers.

[0006] As a result, video distribution systems have evolved to include additional satellites to broadcast additional program material to subscribers. Typically, satellites broadcasting these enhanced services are deployed in geosynchronous orbits in orbital locations proximate to those of the legacy satellites. This allows a single antenna to receive signals from both satellites with little or no physical scanning.

[0007] Electronic program guides for television programming are known in the art. Such program guides typically include a viewer channel number that identifies the stream of television content offered by a content provider and a description of each media program associated with the channel number. Program guide information is typically transmitted along with the television content, and typically also includes schedule information for display on users' televisions. The schedule information informs users what television programs are currently on, and what television programs will be shown in the near future.

[0008] Until recently, satellite-based video distribution systems were prohibited by regulation from transmitting local programs to subscribers within areas where those local programs were locally available by conventional broadcast means. For example, one of the network affiliates for the American Broadcasting Company in Los Angeles is KABC. These regulations prohibited satellite-based video distribution systems from re-transmitting the KABC broadcast to subscribers in the same market area serviced by the regional broadcast affiliate, KABC. These limitations, however, were eliminated by Congress through the Satellite Home Viewing Improvement Act (SHIVA). Satellite-based video distribution systems can now transmit such "local content" to subscribers within the market areas serviced by the original broadcast provider.

[0009] While this capability enhances the desirability of a satellite-based video distribution system, it raises a number of difficulties. First, there are a large number of local market areas, each with a large number of channels. In Los Angeles, for example, there are seven local content providers broadcasting on very high frequencies (VHF) and more than a dozen local content providers broadcasting on ultra high frequencies (UHF). Providing local content to subscribers in all market areas places large demands on transmission bandwidth. The transmission of program guide information describing the local content is also problematic. To serve dozens of local market areas, each with many channels, program guide information for literally hundreds of local content programs would be required. Each subscriber's receiver could be overwhelmed with information about channels that it cannot or should not receive.

[0010] Further, there are literally millions of satellite broadcast receivers in service. While it is possible to present local program guide information by updating or replacing these satellite broadcast receivers, this cannot be accomplished without incurring substantial (and prohibitive) costs.

[0011] What is needed is a method and apparatus for providing local program guide information to media subscribers in designated areas. It is also necessary that the method and apparatus be compatible with existing satellite broadcast receivers. The present invention satisfies that need.

SUMMARY OF THE INVENTION

[0012] In summary, the present invention describes a system and method for transmitting program guide information describing a second set of programs to subscribers. In one embodiment, the method is implemented in a network broadcasting a first signal having a first set of programs and a second signal having a second set of programs. The method comprises the steps of broadcasting first program guide information describing the first set of programs to the subscribers on a first service channel on a first signal; and broadcasting second program guide information describing the second set of programs to a subset of the subscribers on the first service channel on a second signal, wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal. In another embodiment, the method comprises the steps of receiving first program guide information describing the first set of programs on a first service channel on a first signal; and receiving second program guide information describing the second set of programs on the first service channel on a second signal, wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Referring now to the drawings in which like reference numbers represent corresponding parts throughout:

[0014] FIG. 1 is a diagram showing an overview of a video distribution system;

[0015] FIG. 2 is a block diagram showing a typical uplink configuration showing how video program material is uplinked to a satellite for transmission to subscribers using a single transponder;

[0016] FIG. 3 is a block diagram of one embodiment of the program guide subsystem;

[0017] FIG. 4A is a diagram of a representative data stream received from a satellite;

[0018] FIG. 4B is a diagram illustrating the structure of a data packet;

[0019] FIG. 5 is a block diagram of one embodiment of an integrated receiver/decoder;

[0020] FIG. 6 is an illustration of an embodiment of the present invention using two satellites;

[0021] FIG. 7 is a mapping showing a relationship between service channels program content for the first and second signals;

[0022] FIG. 8 is a diagram showing one embodiment of a master program guide providing information regarding the first set of programs;

[0023] FIG. 9 is a diagram showing one embodiment of a master program guide providing information regarding the second set of programs;

[0024] FIG. 10 is a flow chart illustrating exemplary method steps used to practice one embodiment of the present invention; and

[0025] FIG. 11 is a flow chart illustrating exemplary method steps used to practice a second embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0026] In the following description reference is made to the accompanying drawings which form a part hereof and which show, by way of illustration, several embodiments of the present invention. It is understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

Video Distribution System

[0027] FIG. 1 is a diagram illustrating an overview of a single satellite video distribution system 100. The video distribution system 100 comprises a control center 102 in communication with an uplink center 104 via a ground or other link 114 and with a subscriber receiver station 110 via a public switched telephone network (PSTN) or other link 120. The control center 102 provides program material (e.g. video programs, audio programs and data) to the uplink center 104 and coordinates with the subscriber receiver stations 110 to offer, for example, pay-per-view (PPV) program services, including billing and associated decryption of video programs.

[0028] The uplink center receives program material and program control information from the control center 102, and using an uplink antenna 106 and transmitter 105, transmits the program material and program control information to the satellite 108. The satellite receives and processes this information, and transmits the video programs and control information to the subscriber receiver station 110 via downlink 118 using transmitter 107. The subscriber receiving station 110 receives this information using the outdoor unit (ODU) 112, which includes a subscriber antenna and a low noise block converter (LNB).

[0029] In one embodiment, the subscriber receiving station antenna is an 18-inch slightly oval-shaped Ku-band antenna. The slight oval shape is due to the 22.5 degree offset feed of the LNB (low noise block converter) which is used to receive signals reflected from the subscriber antenna. The offset feed positions the LNB out of the way so it does not block any surface area of the antenna minimizing attenuation of the incoming microwave signal.

[0030] The video distribution system 100 can comprise a plurality of satellites 108 in order to provide wider terrestrial coverage, to provide additional channels, or to provide additional bandwidth per channel. In one embodiment of the invention, each satellite comprises 16 transponders to receive and transmit program material and other control data from the uplink center 104 and provide it to the subscriber receiving stations 110. Using data compression and multiplexing techniques the channel capabilities, two satellites 108 working together can receive and broadcast over 150 conventional (non-HDTV) audio and video channels via 32 transponders.

[0031] While the invention disclosed herein will be described with reference to a satellite-based video distribution system 100, the present invention may also be practiced with terrestrial-based transmission of program information, whether by broadcasting means, cable, or other means. Further, the different functions collectively allocated among the control center 102 and the uplink center 104 as described above can be reallocated as desired without departing from the intended scope of the present invention.

[0032] Although the foregoing has been described with respect to an embodiment in which the program material delivered to the subscriber 122 is video (and audio) program material such as a movie, the foregoing method can be used to deliver program material comprising purely audio information or other data as well.

Uplink Configuration

[0033] FIG. 2 is a block diagram showing a typical uplink configuration for a single satellite 108 transponder, showing how video program material is uplinked to the satellite 108 by the control center 102 and the uplink center 104. FIG. 2 shows three video channels (which could be augmented respectively with one or more audio channels for high fidelity music, soundtrack information, or a secondary audio program for transmitting foreign languages), a data channel from a program guide subsystem 206 and computer data information from a computer data source 208.

[0034] The video channels are provided by a program source of video material 200A-200C (collectively referred to hereinafter as video source(s) 200). The data from each video program source 200 is provided to an encoder 202A-202C (collectively referred to hereinafter as encoder(s) 202). Each of the encoders accepts a program time stamp (PTS)

from the controller **216**. The PTS is a wrap-around binary time stamp that is used to assure that the video information is properly synchronized with the audio information after encoding and decoding. A PTS time stamp is sent with each I-frame of the MPEG encoded data.

[0035] In one embodiment of the present invention, each encoder **202** is a second generation Motion Picture Experts Group (MPEG-2) encoder, but other decoders implementing other coding techniques can be used as well. The data channel can be subjected to a similar compression scheme by an encoder (not shown), but such compression is usually either unnecessary, or performed by computer programs in the computer data source (for example, photographic data is typically compressed into *.TIF files or *.JPG files before transmission). After encoding by the encoders **202**, the signals are converted into data packets by a packetizer **204A-204F** (collectively referred to hereinafter as packetizer(s) **204**) associated with each source **200**.

[0036] The data packets are assembled using a reference from the system clock **214** (SCR), and from the conditional access manager **210**, which provides the SCID to the packetizers **204** for use in generating the data packets. These data packets are then multiplexed into serial data and transmitted.

Program Guide Subsystem

[0037] **FIG. 3** is a block diagram of one embodiment of the program guide subsystem **206**. The program guide data transmitting system **206** includes program guide database **302**, compiler **304**, sub-databases **306A-306C** (collectively referred to as sub-databases **306**) and cyclers **308A-308C** (collectively referred to as cyclers **308**).

[0038] Schedule feeds **310** provide electronic schedule information about the timing and content of various television channels, such as that found in television schedules contained in newspapers and television guides. Schedule feeds **310** preferably include information from one or more companies that specialize in providing schedule information, such as GNS, TRIBUNE MEDIA SERVICES, and T.V. DATA. The data provided by companies such as GNS, TRIBUNE MEDIA SERVICES and T.V. DATA are typically transmitted over telephone lines to program guide database **302**. These companies provide television schedule data for all of the television stations across the nation plus the nationwide channels, such as SHOWTIME, HBO, and the DISNEY CHANNEL. The specific format of the data that are provided by these companies varies from company to company. Program guide database **302** preferably includes schedule data for television channels across the entire nation including all nationwide channels and local channels, regardless of whether the channels are transmitted by the transmission station.

[0039] Program guide database **302** is a computer-based system that receives data from schedule feeds **310** and organizes the data into a standard format. Compiler **304** reads the standard form data out of program guide database **302**, identifies common schedule portions, converts the program guide data into the proper format for transmission to users (specifically, the program guide data are converted into objects as discussed below) and outputs the program guide data to one or more of sub-databases **306**.

[0040] Program guide data can also be manually entered into program guide database **302** through data entry station **312**. Data entry station **312** allows an operator to enter additional scheduling information, as well as combining and organizing data supplied by the scheduling companies. As with the computer organized data, the manually entered data are converted by the compiler into separate objects and sent to one or more of sub-databases **306**.

[0041] The program guide objects are temporarily stored in sub-databases **306** until cyclers **308** request the information. Each of cyclers **308** may transmit objects at a different rate than the other cyclers **308**. For example, cycler **308A** may transmit objects every second, while cyclers **308B** and **308C** may transmit objects every 5 seconds and every 10 seconds, respectively.

[0042] Since the subscriber's receivers may not always be on and receiving and saving objects, the program guide information is continuously re-transmitted. Program guide objects for programs that will be shown in the next couple of hours are sent more frequently than program guide objects for programs that will be shown later. Thus, the program guide objects for the most current programs are sent to a cycler **308** with a high rate of transmission, while program guide objects for later programs are sent to cyclers **308** with a lower rate of transmission. One or more of the data outputs **314** of the cyclers **308** are forwarded to the packetizer of a particular transponder, as depicted in **FIG. 2**.

[0043] It is noted that the uplink configuration depicted in **FIG. 2** and the program guide subsystem depicted in **FIG. 3** can be implemented by one or more hardware modules, one or more software modules defining instructions performed by a processor, or a combination of both.

Broadcast Data Stream Format and Protocol

[0044] **FIG. 4A** is a diagram of a representative data stream. The first packet segment **402** comprises information from video channel **1** (data coming from, for example, the first video program source **200A**). The next packet segment **404** comprises computer data information that was obtained, for example from the computer data source **208**. The next packet segment **406** comprises information from video channel **5** (from one of the video program sources **200**). The next packet segment **408** comprises program guide information such as the information provided by the program guide subsystem **206**. As shown in **FIG. 4A**, null packets **410** created by the null packet module **410** may be inserted into the data stream as desired.

[0045] The data stream therefore comprises a series of packets from any one of the data sources in an order determined by the controller **216**. The data stream is encrypted by the encryption module **218**, modulated by the modulator **220** (typically using a QPSK modulation scheme), and provided to the transmitter **222**, which broadcasts the modulated data stream on a frequency bandwidth to the satellite via the antenna **106**. The receiver **500** receives these signals, and using the SCID, reassembles the packets to regenerate the program material for each of the channels.

[0046] **FIG. 4B** is a diagram of a data packet. Each data packet (e.g. **402-416**) is 147 bytes long, and comprises a number of packet segments. The first packet segment **420** comprises two bytes of information containing the SCID and flags. The SCID is a unique 12-bit number that uniquely identifies the data packet's data channel. The flags include 4

4

bits that are used to control other features. The second packet segment **422** is made up of a 4-bit packet type indicator and a 4-bit continuity counter. The packet type identifies the packet as one of the four data types (video, audio, data, or null). When combined with the SCID, the packet type determines how the data packet will be used. The continuity counter increments once for each packet type and SCID. The next packet segment **424** comprises 127 bytes of payload data, which in the cases of packets **402** or **406** is a portion of the video program provided by the video program source **200**. The final packet segment **426** is data required to perform forward error correction.

Integrated Receiver/Decoder

[0047] **FIG. 5** is a block diagram of an integrated receiver/ decoder (IRD) **500** (also hereinafter alternatively referred to as receiver **500**). The receiver **500** comprises a tuner/ demodulator **504** communicatively coupled to an ODU **112** having one or more LNBs **502**. The LNB **502** converts the 12.2- to 12.7 GHz downlink **118** signal from the satellites **108** to, e.g., a 950-1450 MHz signal required by the IRD's **500** tuner/demodulator **504**. The LNB **502** may provide either a dual or a single output. The single-output LNB **502** has only one RF connector, while the dual output LNB **502** has two RF output connectors and can be used to feed a second tuner **504**, a second receiver **500**, or some other form of distribution system.

[0048] The tuner/demodulator **504** isolates a single, digitally modulated 24 MHz transponder, and converts the modulated data to a digital data stream. The digital data stream is then supplied to a forward error correction (FEC) decoder **506**. This allows the IRD **500** to reassemble the data transmitted by the uplink center **104** (which applied the forward error correction to the desired signal before transmission to the subscriber receiving station **110**) verifying that the correct data signal was received, and correcting errors, if any. The error-corrected data may be fed from the FEC decoder module **506** to the transport module **508** via an 8-bit parallel interface.

[0049] The transport module **508** performs many of the data processing functions performed by the IRD **500**. The transport module **508** processes data received from the FEC decoder module **506** and provides the processed data to the video MPEG decoder **514** and the audio MPEG decoder **517**. In one embodiment of the present invention, the transport module, video MPEG decoder and audio MPEG decoder are all implemented on integrated circuits. This design promotes both space and power efficiency, and increases the security of the functions performed within the transport module **508**. The transport module **508** also provides a passage for communications between the microcontroller **510** and the video and audio MPEG decoders **514**, **517**. As set forth more fully hereinafter, the transport module also works with the conditional access module (CAM) **512** to determine whether the subscriber receiving station **110** is permitted to access certain program material. Data from the transport module can also be supplied to external communication module **526**.

[0050] The CAM **512** functions in association with other elements to decode an encrypted signal from the transport module **508**. The CAM **512** may also be used for tracking and billing these services. In one embodiment of the present

invention, the CAM **512** is a smart card, having contacts cooperatively interacting with contacts in the IRD **500** to pass information. In order to implement the processing performed in the CAM **512**, the IRD **500**, and specifically the transport module **508** provides a clock signal to the CAM **512**.

[0051] Video data is processed by the MPEG video decoder **514**. Using the video random access memory (RAM) **536**, the MPEG video decoder **514** decodes the compressed video data and sends it to an encoder or video processor **516**, which converts the digital video information received from the video MPEG module **514** into an output signal usable by a display or other output device. By way of example, processor **516** may comprise a National TV Standards Committee (NTSC) or Advanced Television Systems Committee (ATSC) encoder. In one embodiment of the invention both S-Video and ordinary video (NTSC or ATSC) signals are provided. Other outputs may also be utilized, and are advantageous if high definition programming is processed.

[0052] Audio data is likewise decoded by the MPEG audio decoder **517**. The decoded audio data may then be sent to a digital to analog (D/A) converter **518**. In one embodiment of the present invention, the D/A converter **518** is a dual D/A converter, one for the right and left channels. If desired, additional channels can be added for use in surround sound processing or secondary audio programs (SAPs). In one embodiment of the invention, the dual D/A converter **518** itself separates the left and right channel information, as well as any additional channel information. Other audio formats may similarly be supported. For example, other audio formats such as multi-channel DOLBY DIGITAL AC-3 may be supported.

[0053] A description of the processes performed in the encoding and decoding of video streams, particularly with respect to MPEG and JPEG encoding/decoding, can be found in Chapter 8 of "Digital Television Fundamentals," by Michael Robin and Michel Poulin, McGraw-Hill, 1998, which is hereby incorporated by reference herein.

[0054] The microcontroller **510** receives and processes command signals from the remote control **524**, an ERD **500** keyboard interface, and/or another input device. The microcontroller receives commands for performing its operations from a processor programming memory, which permanently stores such instructions for performing such commands. The processor programming memory may comprise a read only memory (ROM) **538**, an electrically erasable programmable read only memory (EEPROM) **522** or, similar memory device. The microcontroller **510** also controls the other digital devices of the IRD **500** via address and data lines (denoted "A" and "D" respectively, in **FIG. 5**).

[0055] The modem **540** connects to the customer's phone line via the PSTN port **120**. It calls, e.g. the program provider, and transmits the customer's purchase information for billing purposes, and/or other information. The modem **540** is controlled by the microprocessor **510**. The modem **540** can output data to other I/O port types including standard parallel and serial computer I/O ports.

[0056] The present invention also comprises a local storage unit such as the video storage device **532** for storing video and/or audio data obtained from the transport module

508. Video storage device 532 can be a hard disk drive, a read/writable compact disc of DVD, a solid state RAM, or any other storage medium. In one embodiment of the present invention, the video storage device 532 is a hard disk drive with specialized parallel read/write capability so that data may be read from the video storage device 532 and written to the device 532 at the same time. To accomplish this feat, additional buffer memory accessible by the video storage 532 or its controller may be used. Optionally, a video storage processor 530 can be used to manage the storage and retrieval of the video data from the video storage device 532. The video storage processor 530 may also comprise memory for buffering data passing into and out of the video storage device 532. Alternatively or in combination with the foregoing, a plurality of video storage devices 532 can be used. Also alternatively or in combination with the foregoing, the microcontroller 510 can also perform the operations required to store and or retrieve video and other data in the video storage device 532.

[0057] The video processing module 516 input can be directly supplied as a video output to a viewing device such as a video or computer monitor. In addition, the video and/or audio outputs can be supplied to an RF modulator 534 to produce an RF output and/or 8 vestigal side band (VSB) suitable as an input signal to a conventional television tuner. This allows the receiver 500 to operate with televisions without a video output.

[0058] Each of the satellites 108 comprises a transponder, which accepts program information from the uplink center 104, and relays this information to the subscriber receiving station 110. Known multiplexing techniques are used so that multiple channels can be provided to the user. These multiplexing techniques include, by way of example, various statistical or other time domain multiplexing techniques and polarization multiplexing. In one embodiment of the invention, a single transponder operating at a single frequency band carries a plurality of channels identified by respective service channel identification (SCID).

[0059] Preferably, the IRD 500 also receives and stores a program guide in a memory available to the microcontroller 510. Typically, the program guide is received in one or more data packets in the data stream from the satellite 108. The program guide can be accessed and searched by the execution of suitable operation steps implemented by the microcontroller 510 and stored in the processor ROM 538. The program guide may include data to map viewer channel numbers to satellite transponders and service channel identifications (SCIDs), and also provide TV program listing information to the subscriber 122 identifying program events.

[0060] The functionality implemented in the IRD 500 depicted in FIG. 5 can be implemented by one or more hardware modules, one or more software modules defining instructions performed by a processor, or a combination of both.

[0061] FIG. 6 is a diagram presenting a view of an enhanced video distribution system 600 utilizing spot beams to provide local channel content. In this embodiment, one or more satellites such as satellite 108 broadcast a first signal 616 via beam 604 to provide services to subscribers having receiver stations 110 located within a particular large geographical area 606 such as CONUS. The first signal 616 broadcasts a first set of programs to all subscribers, including receiver stations 110 and receiver station 612. The first signal includes a plurality of service channels, each with a unique service channel identifier (SCID). As described herein, each program in the first set of programs is typically dedicated to a particular service channel when it is being broadcast.

[0062] One or more second satellites 602 broadcast a second signal 618 via spot beam 608 to provide services to subscribers having receiver stations 612 located in a particular local area or region 610. The second signal broadcasts at least a second set of programs to subscribers having receiver stations 612 located in the local area or region 610. In one embodiment, the second signal also includes some or all of the first set of programs as well. Like the first signal, the second signal includes a plurality of service channels with unique SCIDs.

[0063] Besides content, the second signal 618 differs from the first signal 616 in a fundamental signal characteristic. In one embodiment, the second signal 618 differs from the first signal 616 in frequency. In another embodiment, the second signal 618 differs from the first signal 616 in polarization. In any case, the difference in fundamental signal characteristic allows the first signal 616 and the second signal 618 to be received by the same receiver station 612 and to be distinguishable from one another. However, both the first signal 616 and the second signal 618 share the same channel sharing scheme (i.e. essentially a TDMA scheme with channels denoted by SCID).

[0064] Essentially, the boundaries of the local area or region 610 separate subscribers into groups that can be defined in many ways. For example, in one embodiment, the local area or region 610 is an area defined by the locus of locations wherein a signal broadcast by a terrestrial transmitter 614 can be received by receiver stations 612 in the area with a minimum level of quality. Such boundaries can depend on weather and other atmospheric conditions as well as terrain. Hence, the local area or region 610 can be defined according to statistical signal quality. Local area or region 610 can also be a geopolitical boundary, designated according to agreement or subscriber characteristics, such as a designation that the subscriber receive a particular program set.

[0065] FIG. 6 illustrates an embodiment wherein the first signal 616 is transmitted by a first satellite 108 and the second signal 618 is transmitted by a second satellite 602. However, each of the satellites 108 and 602 can comprise a plurality of transponders, each operating at a different frequency, and/or transmitting signals at a different polarization. Hence, although FIG. 6 illustrates an embodiment in which the first signal 616 and second signal 618 are transmitted by satellites that are sufficiently proximate to be within the beamwidth of the receiver station's antenna, the present invention could also be implemented with a single satellite transmitting the first signal 616 and the second signal 618 as well.

[0066] FIG. 7 is a mapping 700 showing how the program guide information, that is, the program content, is transmitted. The first content 704 (labeled "CONUS MPG CONTENT") is carried on the first signal 616 from the first satellite 108, and the second content 706 (labeled "SPOT BEAM CONTENT") is carried on the second signal 618

from the second satellite **602**. The first content **704** includes descriptive information **716** about the first set of programs that are transmitted on the first signal **616**. The second content **706** includes descriptive information **718** about the first set of programs that are transmitted on the first signal **616**. As the first set of programs is available to the entire service area **606**, the descriptive information of **716** and **718** is the same. The first content **704** and second content **706** additionally includes descriptive information (**720** and **722**) about the second set of programs that are transmitted on the second signal **618**. However, as the second set of programs is only available to the service area **610**, the descriptive information of **720** is intentionally different than the descriptive information of **722**. In the illustrated example, the second set of programs **722** is broadcast on SCIDs 0×49A-0×4FF. The second content **706** includes descriptive information **722** for local channels **1** through **101**, while the first content **704** includes descriptive information **720** that does not specifically describe local channels **1** through **101**.

[0067]   **FIG. 8** is a diagram showing one embodiment of the first content **704**. In the illustrated embodiment, the first content **704** includes a channel number column **802** indicating viewer channels, a channel descriptor column **804** having channel descriptions **814** to indicate the source of the program provided on the channel, and a plurality of program content descriptor columns **806A-806C** having program description information **816A-816C** for programming time slots.

[0068]   In the illustrated embodiment, the first set of programs **810** are presented with specific information regarding each program also presented in the succeeding columns.

[0069]   In the illustrated embodiment, local channel **1** through local channel **101814** are presented generically by "surrogate" channels **900-1000**. That is, specific program information is not included, but an indication that channels **900-1000** are dedicated to rebroadcast local content is indicated. In one embodiment, information **816A-816C** is also provided in program content descriptor columns **806A** through **806C** to indicate that additional program information regarding these local channels can be obtained by selecting the viewer channel **802** for the local channel of interest. This selection is typically made with the use of a user interface device such as the remote control or keyboard **524**.

[0070]   When the user selects one of channels **810**, the transport chip **508** in the IRD **500** finds data packets with the proper SCID, and assembles and prepares them for presentation. However, when the user selects one of the viewer channels dedicated to local programming (e.g. local channels **812**), the IRD **500** is configured to receive the second signal **618** from the second satellite **602**. This can be accomplished in a number of ways. In one embodiment, the IRD **500** is simply tuned to receive a different frequency matching the transmissions from the transponder on the second satellite **602** transmitting the second signal **618**. In another embodiment, the receiver station **110** is reconfigured to receive the second signal **618** at a different polarization than the first signal. In yet another embodiment, the receiver station's antenna is mechanically or electronically steered to a second satellite, or a second LNB is selected effectively displacing the beam sensitivity pattern of the receiver station **110** antenna. Alternatively or in addition to the above, the

selection of the second signal **618** can be accomplished by a direct command from the user (rather than by the selection of a viewer channel associated with one of the local channels **812**).

[0071]   The second signal **618**, includes second program guide information, as manifested by the second content **706**. The IRD **500** loads this second program guide information, and presents it to the subscriber **112** for viewing.

[0072]   **FIG. 9** is a diagram showing one embodiment of the second content **706**. In the illustrated embodiment, the second content **706** includes the same information regarding the first set of programs **810**. However, in addition, the second content **706** also includes specific information regarding the local channels **1-101**. In the place of the generic information presented in **FIG. 8**, columns **804** and **806A-806C** include specific information about the source of the information presented in the viewer channel (e.g. "KCBS 2") and the content information regarding the programs themselves (e.g. "News" or "Perry Mason") **906A-906C**.

[0073]   **FIG. 10** is a flow chart illustrating exemplary method steps used to practice one embodiment of the present invention. As shown in block **1002** the satellite **108** broadcasts first program guide information describing a first set of programs to the subscribers (including, for example, those associated with receiver stations **110** and **612**) on a first channel of a first signal **616**. As shown in block **1004**, a second satellite **602** broadcasts second program guide information describing a second set of programs to a subset of the subscribers (e.g. those associated with receiver stations **616** within the local area or region **610**) on the first service channel, but on a second signal **618** wherein the a signal characteristic of the first signal and the second signal differ (e.g. polarization, frequency, or coding). Because the first program guide information and the second program guide information are presented on the same service channels, differing program guide information can be presented for each signal without requiring changes to the IRD **500**.

[0074]   **FIG. 11** is a flow chart illustrating exemplary method steps used to practice another embodiment of the present invention. First program guide information describing a first set of programs on a first service channel on a first signal is received, as shown in block **1102**. The subscriber **112** can select a number of channels from the first program guide (e.g. CONUS MPG). If at least one of the selected channel is one of the surrogate channels **900-1000** dedicated to local programming, the receiver station **612** is tuned to receive second program guide information (e.g. SPOT BEAM MPG) on the first service channel of the second signal **618**. The second program guide information is received via the second signal **618** and presented to the subscriber **112**. This is depicted in steps **1104-1108**.

Conclusion

[0075]   This concludes the description of the preferred embodiments of the present invention. The foregoing description of the preferred embodiment of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications and variations are possible in light of the above teaching.

[0076] It is intended that the scope of the invention be limited not by this detailed description, but rather by the claims appended hereto. The above specification, examples and data provide a complete description of the manufacture and use of the composition of the invention. Since many embodiments of the invention can be made without departing from the spirit and scope of the invention, the invention resides in the claims hereinafter appended.

What is claimed is:

1. In a network broadcasting a first signal having a first set of programs to a plurality of subscribers and a second signal having a second set of programs, a method of providing program guide information describing the second set of programs, comprising:

   broadcasting first program guide information describing the first set of programs to the subscribers on a first service channel on a first signal; and

   broadcasting second program guide information describing the second set of programs to a subset of the subscribers on the first service channel on a second signal, wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal.

2. The method of claim 1, wherein the fundamental signal characteristic is carrier frequency, and the first signal is characterized by a first carrier frequency and the second signal is characterized by a second carrier frequency.

3. The method of claim 1, wherein the fundamental signal characteristic is polarization and the first signal is characterized by a first polarization and the second signal is characterized by a second polarization.

4. The method of claim 1, wherein the first program guide information includes information describing at least one surrogate channel.

5. The method of claim 4, wherein a subscriber selection of at least one of the at least one surrogate channels commands reception of the second signal.

6. The method of claim 1, wherein the second signal is a spot beam directed at the subset of subscribers.

7. The method of claim 1, wherein the second set of programs comprise local programs and the second signal is a spot beam directed at a subset of the subscribers that are designated to receive the second set of programs.

8. The method of claim 1, wherein the second signal further includes a portion of the first set of programs and the second program information further describes the portion of the first set of programs.

9. In a network broadcasting a first signal having a first set of programs to a plurality of subscribers and a second signal having a second set of programs to a subset of the subscribers, a method of receiving program guide information describing the second set of programs, comprising the steps of:

   receiving first program guide information describing the first set of programs on a first service channel on a first signal; and

   receiving second program guide information describing the second set of programs on the first service channel on a second signal, wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal.

10. The method of claim 9, wherein the fundamental signal characteristic is carrier frequency, and the first signal is characterized by a first carrier frequency and the second signal is characterized by a second carrier frequency.

11. The method of claim 9, wherein the fundamental signal characteristic is polarization and the first signal is characterized by a first polarization and the second signal is characterized by a second polarization.

12. The method of claim 10, wherein the first program guide information includes information describing at least one surrogate channel and the method further comprises the step of:

   accepting a selection of at least one of the at least one surrogate channels in a receiver; and

   receiving the second signal at the second carrier frequency on the first service channel.

13. The method of claim 12, wherein the second signal is a spot beam directed at the receiver.

14. The method of claim 12, wherein the second set of programs are local programs and the second signal is a spot beam directed at a subset of subscribers designated to receive the second set of programs.

15. The method of claim 14, wherein the second signal further includes a portion of the first set of programs and the second program information further describes the portion of the first set of programs.

16. A receiver, comprising:

   a user interface for accepting subscriber commands;

   a tuner selectably configurable to receive a first service channel on a first signal and the first service channel on a second signal, the first signal comprising a first set of programs and first program information describing the first set of programs, and the second signal comprising a second set of programs and second program guide information describing the second set of programs;

   wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal; and

   a processor, communicatively coupled to the user interface and the tuner, for retrieving the first program information and the second program information for providing the first and second program information to a presentation device, and for accepting subscriber commands from the user interface.

17. The receiver of claim 16, wherein the fundamental signal characteristic is carrier frequency, and the first signal is characterized by a first carrier frequency and the second signal is characterized by a second carrier frequency.

18. The receiver of claim 16, wherein the fundamental signal characteristic is polarization and the first signal is characterized by a first polarization and the second signal is characterized by a second polarization.

19. The receiver of claim 16, wherein:

   the first program guide includes information describing at least one surrogate channel;

   the subscriber commands include a command to select at least one of the at least one surrogate channels; and

   the processor further tunes the tuner to receive the second program guide information in response to the command to select at least one of the at least one surrogate channels.

20. The receiver of claim 19, wherein the second signal is a spot beam directed at the receiver.

21. The receiver of claim 19, wherein the second set of programs are local programs and the second signal is a spot beam directed at a subset of subscribers designated to receive the second set of programs.

22. The receiver of claim 19, wherein the second signal further includes a portion of the first set of programs and the second program information further describes the portion of the first set of programs.

23. An apparatus for use with a system broadcasting a first signal having a first set of programs to a plurality of subscribers and a second signal having a second set of programs to a subset of the subscribers, comprising:

   a compiler, configured to segment the programs into the first set of programs and the second set of programs, and to generate first program guide describing the first set of programs and second program guide information describing the second set of programs;

   a first transmitter, communicatively coupled to the compiler, for transmitting first program guide information on a first service channel on a first signal; and

   a second transmitter, communicatively coupled to the compiler, for transmitting the second program guide information on a second service channel on a second signal;

   wherein a fundamental signal characteristic of the second signal differs from the fundamental signal characteristic of the first signal.

24. The apparatus of claim 23, wherein the fundamental signal characteristic is carrier frequency, and the first signal is characterized by a first carrier frequency and the second signal is characterized by a second carrier frequency.

25. The apparatus of claim 23, wherein the fundamental signal characteristic is polarization and the first signal is characterized by a first polarization and the second signal is characterized by a second polarization.

26. The apparatus of claim 23, wherein the first transmitter comprises a first transponder and the second transmitter comprises a second transponder.

27. The apparatus of claim 26, wherein the first transponder and the second transponder are disposed on a satellite.

28. The apparatus of claim 23, wherein the first transponder is disposed on a first satellite and the second transponder is disposed on a second satellite, and wherein the first satellite and the second satellite are disposed within a beamwidth of a receiver antenna.

29. The apparatus of claim 23, wherein the first program guide information includes information describing at least one surrogate channel.

30. The apparatus of claim 23, wherein a subscriber selection of at least one of the at least one surrogate channels commands reception of the second signal.

31. The apparatus of claim 23, wherein the second signal is a spot beam directed at a subset of subscribers.

32. The apparatus of claim 23, wherein the second set of programs comprise local programs and the second signal is a spot beam directed at a subset of the subscribers that are designated to receive the second set of programs.

33. The apparatus of claim 23, wherein the second signal further includes a portion of the first set of programs and the second program information further describes a portion of the first set of programs.

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