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Simplified Programming of a Videocassette
Recorder having multiple and single
Channel Signal Sources

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The present application concerns the field of video-
cassette recorders (VCRs) and apparatus for pro-
gramming them. It is related to patent
applications 9209050.5, 9209051.3 and 9209053.9, and
10 to a further co-pending patent application 9210344.9
entitled Simplified Programming of a Videocassette
Recorder having a Single Channel Signal Source.

It is generally believed that many, if not the vast
15 majority, of people are simply unable to program
their VCRs to record a desired television program on
a given channel, at a given time and date. VCR
manufacturers have provided different programming
schemes in an attempt to address this undesirable
20 situation, with little success.

Early VCRs such as the VET 650 manufactured by RCA
Corporation, Indianapolis, Indiana, were programmed
by means of pushbuttons mounted on the front panel
25 of the VCR. The pushbuttons controlled the entry of
time-on, time-off, date, and channel number data.
Feedback was provided to the user by means of a
front-panel-mounted LED (light emitting diode)
display. While such systems accomplished the
30 programming task, they were not perceived as being
user-friendly.

Later VCRs such as the Panasonic model PV-4800
manufactured by Panasonic Company, Division of

Matsushita Electric Corporation of America, Secaucus, New Jersey, provided on-screen programming in an effort to make programming the VCR a less intimidating and confusing task. Nonetheless, users

may still be confused by the numerous programming steps involved.

5 Panasonic VCR model PV-2812 employs a bar-code reader for programming the recording of television shows. In this system, a user draws a bar-code reader across the appropriate codes printed on a bar-code sheet. This solution is considered inadequate for several reasons. First, most newspapers do not print television schedule bar-codes. Second, such printed bar-code sheets tend to be relatively large pieces of paper which
10 should be stored in a place, presumably near the VCR, where they will be readily available for programming. Third, the user must use yet another piece of equipment (i.e., the bar-code reader) in order to read-in the code for his desired television show.

15 When the user is a subscriber to a cable television system, his confusion concerning VCR programming may be greatly multiplied, because it is common practice in cable television systems to translate programs from their normal "air" channel to a different "cable" channel. For example, a television program broadcast on channel 29 may be received by a cable
20 television subscriber on cable channel 09. Thus, when the channel listed in the channel guide of the local newspaper is not the channel upon which the desired television show is actually conveyed by the user's cable TV service, the VCR programming task may appear insurmountable.

25 Recently, a programming simplification system known as VCR PLUS™, manufactured by Gemstar Development Corporation, Pasadena, California, has become available. Briefly, the apparatus of the VCR PLUS™ system resembles a standard remote control handunit. The handunit is preprogrammed with
30 the codes for controlling the VCRs and cable control boxes of many manufacturers. The handunit is then programmed by the user with a unique code comprising 1 to 8 digits, which code corresponds to a particular television show broadcast on a given channel, at a given time and date, and having a given duration. A
35 television show which is broadcast at the most popular viewing time (for example, 7 pm) may have a code which comprises only 1 digit. Conversely, a television show which is broadcast at the least popular viewing time (for example, 3 am) may have a code which

comprises the full 8 digits. These codes are printed in the channel guide section of the viewer's local newspaper along with the normal time and channel information. After entering the unique 1 to 8 digit code for a particular television show to be recorded, the user places the handunit in a cradle mounted on his VCR to ensure that the handunit is in the proper orientation for transmitting data to the IR (infrared) receiver of the VCR. At the proper time, the VCR PLUSTM handunit transmits IR codes to the VCR to turn it on and program it to record the desired television show.

While at first glance, it appears that the VCR PLUSTM system solves the consumer's VCR-programming confusion problem, a significant problem remains. If the user is a cable television subscriber, the VCR PLUSTM system has no way of knowing which broadcast channels are assigned to which cable channels of the user's particular cable service. Thus, to use the same example as given above, a user who is a cable television subscriber must perform a channel-mapping procedure to inform the VCR PLUSTM handunit that channel 29 is actually received on cable channel 09. The VCR PLUSTM system provides a method of selecting each of its channel-programming positions to effect this one-time channel-mapping procedure. However, the task of selecting each position for channel-mapping is in itself somewhat confusing and time-consuming.

There is a further problem that is encountered when users attempt to record a television show from a some cable television systems in that these cable television systems require the use of a receiver unit, normally referred to as a cable box, or set-top converter. In these systems, many cable channels (i.e., the so-called premium channels) are scrambled (i.e., encoded or encrypted) and must be descrambled (i.e., decoded or decrypted) in the cable box. The cable box descrambles the premium channel and converts its RF carrier frequency from its assigned cable channel frequency to a cable box output frequency, normally that of channel 2, 3, 4, or 5. Thus, if the VCR were directly connected to the incoming cable, and if cable channel 40 were a scrambled premium channel, programming the VCR to record cable channel 40 would cause the VCR to record a scrambled signal. That is, the

usable, descrambled version of cable channel 40 appears at the output of the cable box on one of channels 2,3,4 or 5. Unfortunately, if the VCR were to be coupled to the cable box directly, then the ability to tune and record all nonscrambled cable channels would be lost, because the VCR has no control over the cable box channel selection circuitry.

Copending U.K patent application 9209050.5 discloses a programming system built into a VCR which includes VCR PLUSTM capability and autoprogramming capability. That application recognised that the channel-mapping procedure may be greatly simplified by using the autoprogramming feature to locate and program all active channels, and then by mapping in a channel guide list only those channels which are active, instead of requiring the user to select all 125 possible channel-programming positions. It is herein recognised that when a user has access to a cable system via a cable box, and to the cable system directly, that the VCR PLUSTM channel mapping feature may be automatically performed for premium channels from the cable box, thus simplifying the programming even more.

According to the present invention, there is provided a videocassette recorder, comprising a tuner for tuning to each of a plurality of television channels; a memory circuit for storing channel related data in a first list and a second list; a controller for controlling said tuner and storing said data in said memory circuit; and data input circuitry for use by a viewer for entering data; said controller causing said tuner to perform an autoprogramming function in which data indicative of active channels is stored in said first list; said controller associating a channel guide number with a respective active channel number in response to data

input by said viewer, and storing said channel guide number in said second list, said second list storing only a subset of all channel guide numbers; said controller searching said second list for a given channel guide number and upon finding said given channel guide number said controller uses an associated active channel number for tuning; upon failing to find said given channel guide number in said second list, said controller operates in a first or a second predetermined mode of operation, wherein in said first mode of operation said controller uses said given channel guide number for tuning; and in said second mode of operation said controller uses a default channel number for tuning.

Figure 1 shows, in block diagram form, a VCR incorporating the subject invention.

Figure 2 is a flowchart showing a portion of the control program of the controller of Figure 1.

Figures 3a-3u are illustrations showing display screens produced in accordance with the invention.

Figure 4 is a flowchart showing the channel mapping portion of the control program of the controller of Figure 1.

Figure 5 shows blocks of memory locations of the EEPROM of Figure 1.

Figures 6a-6c show various connections of a VCR to a cable television system.

FIGURE 7 shows a flowchart of another portion of the control program of the controller of FIGURE 1.

FIGURE 8 shows a flowchart of yet another portion of the control program of the controller of FIGURE 1.

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Referring to FIGURE 1, radio frequency (RF) signals are applied to an RF input terminal of a tuner assembly 102. Tuner assembly 102 selects a particular RF signal under control of a tuner control unit 104 which applies a tuning control signal to tuner assembly 102 via a wire 103, and applies bandswitching signals via a control bus 103'. Tuner control unit 104 is controlled by a controller 110. Controller 110, which may be a microprocessor or microcomputer, includes a central processing unit (CPU) 112, a read-only memory (ROM) 114, a random access memory 116, and an external electrically-erasable read only memory (EEPROM) 117. Controller 110 generates a control signal for causing tuner control unit 104 to control tuner 102 to select a particular RF signal, in response to user-entered control signals from a local keyboard 120 and from an infrared (IR) receiver 122. IR receiver 122 receives and decodes remote control signals transmitted by a remote control unit 125.

Tuner 102 produces a signal at an intermediate frequency (IF) and applies it to a processing unit 130 comprising a video IF (VIF) amplifying stage, an AFT circuit, a video detector, and a sound IF (SIF) amplifying stage. Processing unit 130 produces a baseband composite video signal (TV), and a sound carrier signal. The sound carrier signal is applied to an audio signal processor unit 135 which includes an audio detector and may include a stereo decoder. Audio signal processor unit 135 produces baseband audio signals and applies them to a signal switch unit 137.

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The baseband video signal (TV) is coupled to a video processor unit 155 and is also applied to signal switch unit 137. Video and audio signals are also applied to a tape recorder unit 165 which causes the signals to be recorded onto video tape.

5 Tape recorder unit 165 has a control input and operates under control of a tape recorder unit controller 160, which may be a microprocessor. Tape recorder unit controller 160 is in turn controlled by control signals from controller 110. Under control of controller 110, an on-screen display processor 140 generates
10 character signals, and applies them to a second input of video signal processor 155, for inclusion in the processed video signal. Signal switch unit 137 is controlled by controller 110 via a control input terminal C to select audio and video signals from audio signal processor 135 and video signal processor 155, or
15 from the output terminals of tape recording unit 165 in the playback mode, and to apply the selected signals to a modulator 139 for modulation onto a particular channel frequency carrier, typically that of channel 3 or channel 4. The circuitry described thus far is known from RCA videocassette recorder model
20 VR520.

Unlike the RCA VR520, which has as its main programming feature a TIMER PROGRAM mode of operation, apparatus according to the subject invention includes both a
25 TIMER PROGRAM programming feature and a VCR PLUS™ programming feature. The control program for the above-mentioned features resides in ROM 114 of controller 110. Electrically-erasable programmable read only memory (EEPROM) 117 is coupled to controller 110, and serves as a non-volatile storage element for storing autoprogramming channel data, user-
30 entered channel data, and VCR PLUS™ channel mapping data.

It is herein recognized that it is a clear advantage for the unit which contains the VCR PLUS™ control code (in the subject case, the VCR) to be coupled to the television antenna line, so that the controller can determine which channels are active. By
35 displaying only the active channels, consumer confusion regarding the channel mapping task is reduced due to shortening of the channel mapping list by elimination of those channels which are inactive.

The present invention will be described with reference to FIGURES 2, and 3a through 3n. With respect to FIGURES 3a through 3n, assume that a VCR according to the present invention is coupled to a television set 300a-300n, having a picture tube 310a-310n, respectively. FIGURE 3a shows a display screen displayed in response to the pressing of the PROGRAM key of remote control handunit 125. Note that by pressing either key 1 or key 2, the user can program a television show for recording by means of the VCR PLUS™ system or by normal TIMER PROGRAM recording, respectively. Options 3 and 4 are standard features and need not be described here.

In response to the pressing of key number 5, VCR SET UP, the display screen of FIGURE 3b is generated, which provides another list of 5 options. Selecting item 1 enables the user to toggle back and forth between controlling tuner 102 to tune NORMAL (i.e., broadcast or "air") and controlling tuner 102 to tune CATV (i.e., cable) frequencies. Selecting item 2 causes an AUTOPROGRAM function to be implemented in which tuner 102 is controlled to search for all active channels and compile a list of channels which are available to be tuned, and those which are inactive and are to be skipped over. The selection of menu item 4 allows a user to add a channel to the list or delete a channel from the autoprogram scan list. Menu item 5 is not relevant to the subject invention and need not be described here. Selection of menu item 3 causes the display of the screen shown in FIGURE 3c.

FIGURE 3c shows the VCR PLUS™ CHANNEL SET UP screen, comprising a lefthand column labelled CATV and a righthand column labelled GUIDE CHANNEL (GUIDE CH). The label CATV is present rather than the label NORMAL, because of a NORM/CATV selection made earlier with respect to the screen menu of FIGURE 3b. In the particular example shown in FIGURE 3c, the first 5 entries of the above-mention autoprogram list are displayed in the lefthand column. A one-for-one mapping of the active channels has produced the list shown in the righthand column. That is, the software contained in ROM 114 assumed that the television program actually received on channel 4 was a program transmitted by the broadcaster who actually broadcasts on channel 4. As a starting point, the same assumption is made

for all other channels received, as shown by the one-for-one correspondence of the column entries. However, as noted above, the signal received on cable channel 09 may have actually been transmitted by the broadcaster on channel 29, and moved to the channel 09 position by the cable company. This causes the following problem. A newspaper TV listing lists a particular television show to be broadcast on a particular date, at a particular time, and on a particular channel, in this case channel 29. The VCR PLUS™ program code printed in the newspaper TV listing will, when descrambled and decoded, produce the channel guide channel number 29, not the channel guide channel number 09. Thus, some means of "mapping" the channel guide channel number 29 to the cable channel number 09 must be provided.

Such channel mapping means is shown in FIGURES 3c and 3d. An arrow 320c is shown pointing to the line containing the channel number to be remapped. The direction of the arrow indicates which column entry will be changed. FIGURE 3c shows the entries before the change, and FIGURE 3d shows the entries after the change (i.e., after the channel 29 data is entered).

As a result of the channel mapping operation, when the channel guide channel number 29 is descrambled and decoded from the VCR PLUS™ code, tuner 102 will be controlled to tune to cable channel 09, on the proper date, at the proper time. The basic operation for descrambling and decoding an entered VCR PLUS™ code is shown in FIGURE 2. All the elements of FIGURE 2 with the exception of elements 235 and 245 are known from the previous implementation of the VCR PLUS™ system. Elements 235 and 245 will be discussed in detail below.

A further advantage of the subject apparatus over the previous implementation of the VCR PLUS™ system is that the display of the VCR PLUS™ system handunit comprises a single line of data, while the subject apparatus displays five lines of data on a television screen. This arrangement produces two advantages. First, it presents the user with five times as much channel mapping information at any given time, and second, it more effectively conveys the notion that the user is viewing a portion of a list comprising multiple entries. It is felt that both of these advantages tend to reduce user confusion.

Advantageously, the subject apparatus requires no pushbuttons unique to the VCR PLUS™ system to be added to the VCR remote control handunit. Thus, customers with previously purchased "unified" or "universal" remote controls (i.e., those remote control handunits having the capability to control both television sets and VCRs of a given manufacturer) are able to use them to program the subject VCR PLUS™-equipped VCR. For example, the handunit of the VCR PLUS™ system includes a REVIEW key, a key generally not found on VCR or television set remote control handunits. In order to provide the REVIEW function, yet maintain downward compatibility with existing remote control handunits, the CHANNEL UP AND CHANNEL DOWN keys are used to scroll through the channel mapping list. FIGURES 3e and 3f illustrate scrolling up and down, respectively, through the channel mapping list. Note that the indicator arrow remains stationary during the scrolling process.

FIGURES 3g and 3h illustrate the process of deleting an entry from the guide channel list stored in EEPROM 117. In FIGURE 3g, the list was scrolled until the indicator pointed to the entry to be deleted, in this case channel 13. Then the STOP key of remote control unit 125 was pressed to perform the deletion. Note that the line containing channel 13 remains on the display of FIGURE 3g with the GUIDE CHANNEL entry erased (i.e., replaced by dashes). This enables the user to replace the value if the deletion was performed in error. However, if the user correctly deleted the entry, the user can complete the deletion of the entire line by simply scrolling the dashed entry off of the screen. When that portion of the list formerly containing the dashed entry is next displayed, the entire line associated with the deleted entry will be absent from the list, as shown in FIGURE 3h (i.e., channel 13 entry missing). Having finished mapping all necessary channels, and deleting all channels which were undesired, the PROGRAM key is pushed to exit the VCR PLUS™ SET UP routines, once again produce the screen of FIGURE 3a.

Pressing key 1 will cause the display of the screen of FIGURE 3i. In FIGURE 3i the user is instructed to enter the VCR PLUS™ code from his local TV listing. In FIGURE 3j a particular 4 digit listing 3538 has been entered. After pressing the ENTER key

of remote control unit 125, the screen of FIGURE 3k is produced. The three choices of the menu screen of FIGURE 3k are well known in the art, are self-explanatory, and need no further explanation here. Pressing key 1 provides the user with a filled-in schedule (FIGURE 3L) derived from the information in the VCR PLUS™ code 3538. In order to avoid user confusion, the channel number displayed in the screen of FIGURE 3L is the remapped channel number (in this example, channel 09) and not the channel number which appears in the newspaper listing (in this example, channel 29). One reason for this is that 09 is the channel number which this particular user would have to enter if he were programming his VCR via the TIMER PROGRAM menu. Thus, the displayed channel numbers of the two programming systems are consistent with one another.

Turning once again to FIGURE 3a, if the user had pressed key 2 TIMER PROGRAM, he would have caused the display of the screen of FIGURE 3m, which is essentially the same as the display of FIGURE 3k for the VCR PLUS™ programming example. If key 1 ONE TIME PROGRAM is pressed, then the display of FIGURE 3n is produced, as is known from the prior art, for manual filling-in of the necessary data.

It is important to note that controller 110 "remembers" if VCR PLUS™ was selected for the last recording (i.e., stores data in a memory location of EEPROM 117), and if so, automatically selects VCR PLUS™ mode for the next recording. That is, the program in ROM 114 controls the display of the screens such that, if VCR PLUS™ mode was selected for the recording of the last TV show, then the next time that the PROGRAM key is pressed, the screen of FIGURE 3a is skipped and the screen of FIGURE 3i is the first screen displayed.

A portion of the control program for controller 110, for controlling a channel mapping operation, is illustrated in the flowchart of FIGURE 4. For ease of understanding, FIGURES 4 and 5 will be explained with reference to each other. The channel-mapping routine of FIGURE 4 is entered at step 400. At step 405, the channel mapping list stored in the channel mapping list area of EEPROM 117 (shown in the righthand portion of FIGURE 5) is displayed.

The addresses 505 of the channel mapping list correspond to television channels (i.e., except for channel 0 in the United States). Each memory location of the channel mapping list comprises eight bits of memory. Seven-bit portions (designated 520 in FIGURE 5) are used for storing the channel guide channel number (0 to 125) and the eighth bit (designated 510) is used to indicate whether or not the channel is active or to be skipped. The lefthand column of memory locations of FIGURE 5 contains the autoprogramming channel scan list. Each location of the autoprogramming channel scan list comprises eight bits of memory, seven for channel number, and the eighth for designating active or skip status for the particular channel. When an autoprogramming sequence is performed, both the autoprogramming channel scan list and the channel mapping list are automatically programmed to contain identical channel data. Thereafter, both lists may be modified independently of each other.

It is important to note that if the user moves to a new geographic area, his autoprogramming channel scan list and channel mapping list must be updated for the active channels in his new area. The task of reprogramming the user's VCR is eased by the subject apparatus because choosing the AUTOPROGRAM feature from the menu of FIGURE 3b automatically reprograms both the autoprogramming scan list and the channel mapping list at essentially the same time. Additional channels added to the autoprogramming scan list (i.e., via the ADD/ERASE function from the menu screen of FIGURE 3b, or via ADD/ERASE keys (not shown) of remote control handunit 125) will automatically be added to the channel mapping list. However, channels deleted from the autoprogramming scan list (i.e., via the ADD/ERASE function from the menu screen of FIGURE 3b, or via ADD/ERASE keys (not shown) of remote control handunit 125) will not automatically be deleted from the channel mapping list. To understand the reasoning behind this method of operation, recall that if a channel is programmed into the autoprogramming scan list, then the tuner will always stop at that channel when scanning down from the next higher channel, or when scanning up from the next lower channel with the CHANNEL DOWN and CHANNEL UP

keys, respectively. If a particular channel is seldom watched, the user may wish to delete it from the autoprogramming scan list to prevent it from being tuned during channel scans. In addition, a cable television subscriber may delete the so-called "Premium"

- 5 channels from his autoprogramming scan list because those channels often convey movies which he may feel are not suitable for viewing by children. Deleting those channels from the autoprogramming scan list causes the tuner to skip those channels during a scan, but they can still be tuned by direct channel
10 number entry. Furthermore, it is felt that a viewer should still be able to record a specific television show on that particular seldom-watched channel, via VCR PLUS™ programming, even though it is not programmed into his autoprogramming scan list.

- Returning to FIGURE 4, as noted above, the control
15 program in program ROM 114 assumes a one-to-one correspondence of active channels to channel guide channels unless otherwise informed. Thus in step 405, the same channel number data is displayed in the righthand channel guide column as shown in FIGURE 3c. The control program now begins to look
20 for keyboard entries from the user. At step 415, a determination is made if an entered keycode is that of the PROGRAM key. As can be seen from FIGURE 3c, the PROGRAM key is used to exit the channel mapping routine. If the keycode is that of the PROGRAM key, then the routine advances to step 417 wherein a
25 determination is made as to whether or not new channel data has been entered. If so, the new channel data is stored (step 419) and the routine is exited. If not, the routine is exited at step 425.

- If at step 415, the received keycode was not that of the PROGRAM key, then the NO path is taken to step 420, wherein
30 a check is made to see if the received keycode is the CHANNEL UP keycode. The control program interprets a CHANNEL UP or CHANNEL DOWN command as an indication that the user is finished modifying the current line. Note that because of this interpretation, there is no need for an ENTER key (which is not
35 present on all existing remote control handunits). Therefore, at step 422 a check is made to see if new channel data has been entered. If so, the new channel data will be stored (step 424), and then the display will be scrolled up one line (step 426). If not, the

routine will advance directly to step 426 for scrolling the display up. The routine then loops around to step 415 to continue examining received keycodes.

5 If at step 420, the received keycode was not that of CHANNEL UP, the routine advances to step 430 to check whether or not the received keycode is that of CHANNEL DOWN. If yes, the routine advances to step 432 wherein a check is made to see if new channel data has been entered. If so, the new channel data will be stored (step 434), and then the display will be scrolled
10 down one line (step 436). If not, the routine will advance directly to step 436 for scrolling the display down. The routine then loops around to step 415 to continue examining received keycodes.

If at step 430, the received keycode was not that of CHANNEL DOWN, the routine advances to step 440 to check
15 whether or not the received keycode is that of the STOP key. If so, The current line is deleted. As noted above, this means that two dashes replace the data in the display of the channel mapping list, as shown in FIGURE 3g. As explained above, if the display is then scrolled to a position in which the dashes are off screen, then
20 the entire line is deleted. Thereafter, scrolling the display back to its original position reveals a display screen in which the entire previously-dashed line is deleted. Conversely, if desired, the program may be written to maintain the dashed entry, to enable easy reprogramming of the deleted line of channel information.
25 After replacing the previously-displayed data with dashes, the routine exits from step 442 and loops around to step 415 to continue examining received keycodes.

If the keycode at step 440 did not correspond to that of the STOP key, then the NO path is taken to step 445 wherein a
30 check is made to see if the received keycode is that of any number key. If not, then it corresponds to an irrelevant code and will be ignored by the routine. In that case, the routine loops around to step 415 without taking any action. In other
embodiments, the particular action associated with the received
35 keycode (e.g., volume down) can be accomplished, and thereafter the channel mapping routine can be resumed, or terminated. If the received keycode is that of any of the number keys, then the YES path is taken to step 450. At step 450, new channel data

corresponding to the received keycode is displayed at the current line, as shown in FIGURE 3d, and then the routine loops around to step 415.

5 With respect to the decision diamonds of steps 417, 422, and 432, it is noted that the EEPROM used has a recommended maximum number of write cycles, and it was felt that it is prudent to check to see if the channel data has been changed rather than waste a write cycle by needlessly storing unchanged data. It is recognized that such a check would be
10 unnecessary with a storage medium having a virtually unlimited number of write cycles.

Deletion of entries in the channel guide list via use of the STOP key is desirable because, unfortunately, the
15 autoprogramming function may find spurious channels and list them as active channels. If so, they will appear in the autoprogramming scan list and be mapped into the channel guide list with a one-to-one correspondence. This may cause the following problem. Assume a cable television service in which cable channel 13 is inactive, but has a spurious signal which is
20 detected by the autoprogramming function thereby falsely identified as an active cable channel. This causes channel 13 to appear in both the autoprogramming scan list and the channel guide list. Further assume that channel 13 is an active broadcast channel delivered by the cable service on cable channel 22. In
25 order to remap broadcast channel 13 to cable channel 22, the user will scan down to the line of the autoprogramming scan list containing channel 22, and change the corresponding channel guide channel number to 13. However, as noted above, channel 13 was falsely identified as an active cable channel, and was
30 automatically mapped in a one-to-one correspondence to channel 13 of the channel guide list. In such a situation, the channel guide list has two entries of channel 13. When a VCR PLUS™ code for channel 13 is entered by a user, it will be descrambled and decoded, and then a search of the channel guide list for a channel
35 13 entry will be performed from the top down. Note that the first entry of channel 13 to be found will be the falsely identified cable channel 13, and not the correct entry remapped to channel 22. This will cause the tuner to tune to inactive cable channel 13

instead of cable channel 22, and the desired television show will not be recorded. In order to solve this problem, the user must delete the first, incorrect, entry of channel 13 from the channel guide list.

5 As a further example, assume that cable channel 02 was deleted from the channel guide list because it was inactive when the VCR PLUS™ set up was performed. Assume further that at a later date channel 02 is added to the cable television service's system. If the VCR PLUS™ code for a television show broadcast on
10 channel 02 is thereafter entered by a user, channel 02 will be descrambled and decoded but will not be found in the channel guide list (see element 235 of FIGURE 2). Therefore, a one-to-one correspondence of broadcast channel number to channel guide number will be assumed, as shown in element 245 of FIGURE 2,
15 and channel 02 will be tuned for recording, even though the channel 02 entry was deleted previously.

 The present invention will now be described with reference to FIGURES 3r-3u, and 6-8. Substantially all of the foregoing has concerned a VCR connected directly to a cable
20 television service, as shown in FIGURE 6a. In FIGURE 6b, a VCR is shown coupled to the RF input via a cable box 610b. Tuner 102 of FIGURES 6a-6b is the same tuner unit 102 previously described with respect to FIGURE 1. FIGURE 6b is the configuration used
25 when all of the television channels provided by the cable television service are encoded in some fashion (i.e., a cable box is required). In such a configuration, the VCR will be set to record all television programs on the cable box output channel (typically, channel 2, 3, or 4). It is herein recognized that in a system
30 according to FIGURE 6b, the above-described channel mapping feature may be eliminated. The set-up procedure for this configurations of FIGURES 6a-6d is shown in FIGURE 7, and is as follows. When the VCR is first turned on, and the program key of its remote control is pressed, the screen of FIGURE 3a appears (step 700 and 705). Pressing key 5 (step 710) causes the display
35 of the screen of FIGURE 3r (step 715). If key 3 is pressed (step 720), the program checks to see if the user had previously selected NORMAL as opposed to CATV from screen 3r. If Yes, then the routine causes the display of the screen of FIGURE 33u (step

730). FIGURE 3u is the channel mapping screen for NORMAL (i.e., air or broadcast) channels, and is essentially the same as FIGURE 3c, previously described. If at step 725, it was found that CATV had been selected, then the routine advances along the NO path to step 735 wherein the screen of FIGURE 3s is displayed. At step 740, if key 1 is pressed it means that the user has a cable television service which does not require a cable box. This is the arrangement shown in FIGURE 3c. In that case, the screen of FIGURE 3c is displayed (step 745). If at step 740 either of keys 2 or 3 were pressed, it means that the user has a cable box in one of configurations 6b or 6c (FIGURE 6d is a special case of FIGURE 6c and will be discussed later). In either case, the screen of FIGURE 3t is displayed, (it is to be understood that the "03" is the output channel of the cable box, and is entered by the user), and the output channel information is stored (step 750). If key 2 were entered from screen 3s, it means that all channels are received via the cable box (i.e., the configuration of FIGURE 6b), and therefore the cable box output channel will automatically be substituted for all channels entered via the VCR PLUS codes. That is, no channel mapping is required at all, and the program exits (step 760) via the NO path from step 755. If however, key 3 was entered from screen 3s, it means that the user has the configuration shown in FIGURE 6c. In that configuration, the premium channels are recorded via the cable box, and all others directly from the incoming cable.

Referring to FIGURE 6c, the incoming cable is applied to a signal splitter 620c, which may be an RCA 2-way splitter model number AH047, sold by Thomson Consumer Electronics, Inc.. One output of splitter 620c is coupled to the input of cable box 610c. The other output of splitter 620c is coupled to one input of an RF signal switch unit 630c (commonly known as an A-B switch), which may be an RCA A-B switch model number AH041, sold by Thomson Consumer Electronics, Inc.. The output of the cable box is coupled to the remaining input terminal of A-B switch unit 630c. The output of A-B switch unit 630c is coupled to the RF input terminal of the VCR. In this configuration, some channel mapping is required for those channels which are received directly from the cable via switch terminal A. Rather than causing

the user to remap all of the premium channels received from the cable box to the cable box output channel, it is herein recognized that no channel mapping is required.

5 This is, because the premium channels are all received on the cable box output channel, and can be treated as follows. The flowchart of FIGURE 8 is identical to that of FIGURE 2 with the exception of the non-correspondence of steps 245 and 845. In Figure 8, which is the FIGURE used with configuration of FIGURE 6c, if a decoded channel guide number does not appear in the
10 channel guide list, then the user-entered cable box output channel is assumed. Thus, all that is necessary for mapping the premium channels is to delete them from the channel guide list, as shown and explained above with regard to FIGURES 3g and 3h. It is noted that in this configuration the user must remember to turn
15 cable box 610c on, select the proper channel, and select the B terminal on A-B switch unit 630c.

It is known from modern television sets (such as RCA color television receiver model number CTC-140R) to include multiple RF input terminals and RF terminal selection circuitry. FIGURE 6d
20 shows a VCR incorporating such RF terminal selection capability. In FIGURE 6d, the A-B switch unit 630d is internal to the VCR, and is electronically controlled (by controller 110 of FIGURE 1) to automatically select the B input when the channel guide number fails to appear in the channel guide list (indicating that it is a
25 premium channel to be recorded from the cable box). That is, step 845 of FIGURE 8 would be modified to also select RF terminal B. The configuration of FIGURE 6d relieves the user of having to remember to set the A-B switch to select the proper terminal.

30 Thus, there has been described, a videocassette recorder including VCR PLUS™ capability and autoprogramming capability, wherein the channel-mapping procedure is greatly simplified for users having cable boxes.

Claims

1. A videocassette recorder, comprising:
 - a tuner for tuning to each of a plurality of television channels;
 - a memory circuit for storing channel related data in a first list and a second list;
 - a controller for controlling said tuner and storing said data in said memory circuit; and
 - data input circuitry for use by a viewer for entering data;
 - said controller causing said tuner to perform an autoprogramming function in which data indicative of active channels is stored in said first list;
 - said controller associating a channel guide number with a respective active channel number in response to data input by said viewer, and storing said channel guide number in said second list, said second list storing only a subset of all channel guide numbers;
 - said controller searching said second list for a given channel guide number and upon finding said given channel guide number said controller uses an associated active channel number for tuning;
 - upon failing to find said given channel guide number in said second list, said controller operates in a first or a second predetermined mode of operation, wherein
 - in said first mode of operation said controller uses said given channel guide number for tuning; and
 - in said second mode of operation said controller uses a default channel number for tuning.
2. The videocassette recorder of claim 1 further comprising,
 - a switch having a first input terminal for receiving television signals on a plurality of said television channels, having a second input terminal



for receiving television signals on a channel identified by said default television channel number, and an output terminal for developing a television signal selected from one of said input terminals, said output of said switch providing television signals to said tuner.

3. The videocassette recorder of claim 2, wherein said switch is external to said videocassette recorder and is user operated.

4. The videocassette recorder of claim 2, wherein said switch is internal to said videocassette recorder and is controlled by said control means.

5. A video cassette recorder substantially as herein described with reference to the accompanying drawings.