Improved RF tuning of television signals

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Improved RF tuning of television signals

This disclosure relates to the field of television signal tuning.

A technique is disclosed that minimizes information that a user needs to provide and that steps through each of several possible tuning standards until it finds a signal.

Tuning a TV (television) receiver to a selected channel requires setting the tuner to a specific frequency. The frequency is determined by a number of parameters:

1. The selected channel number.
2. The country broadcasting the signal (each country may assign a different frequency to a particular television channel number)
3. Whether the broadcast is being received off-air (i.e., via an antenna), or from cable.
4. If the broadcast is from cable, the type of cable system in use: (a) standard, (b) IRC, or (c) HRC.

In the U.S., for off-air broadcasts, the selected channel number ranges from 2-69, and the FCC has assigned a particular frequency to each off-air channel number.

For cable systems, the selected channel ranges from 1-125 for cable systems. However, determining the frequency is more complicated because three different types of cable systems are in use.

A standard cable system does not use channel 1. Cable channels 2-125 each have an assigned frequency. An IRC cable system adds channel 1, and shifts channels 5 and 6 to a different frequency from the standard cable system. All other IRC channels assignments are the same as in the standard cable channel mapping. An HRC cable system uses channels 1-125 and shift all channels to a different frequency from the IRC system.

Once the specific frequency of the channel has been determined based on the channel, the country, the broadcast source, and if necessary the cable system type, the tuner is sent a command to tune to the desired frequency. In the real world, frequencies are often not exactly what they should be. To help compensate, tuners often provide a feedback mechanism which indicates whether the current signal is centered on the desired signal, or whether the current frequency is above or below the desired signal. This feedback signal is called AFC. In some receivers, the feedback signal is used to fine-tune the frequency to improve the signal to noise ratio, resulting in a better quality image.

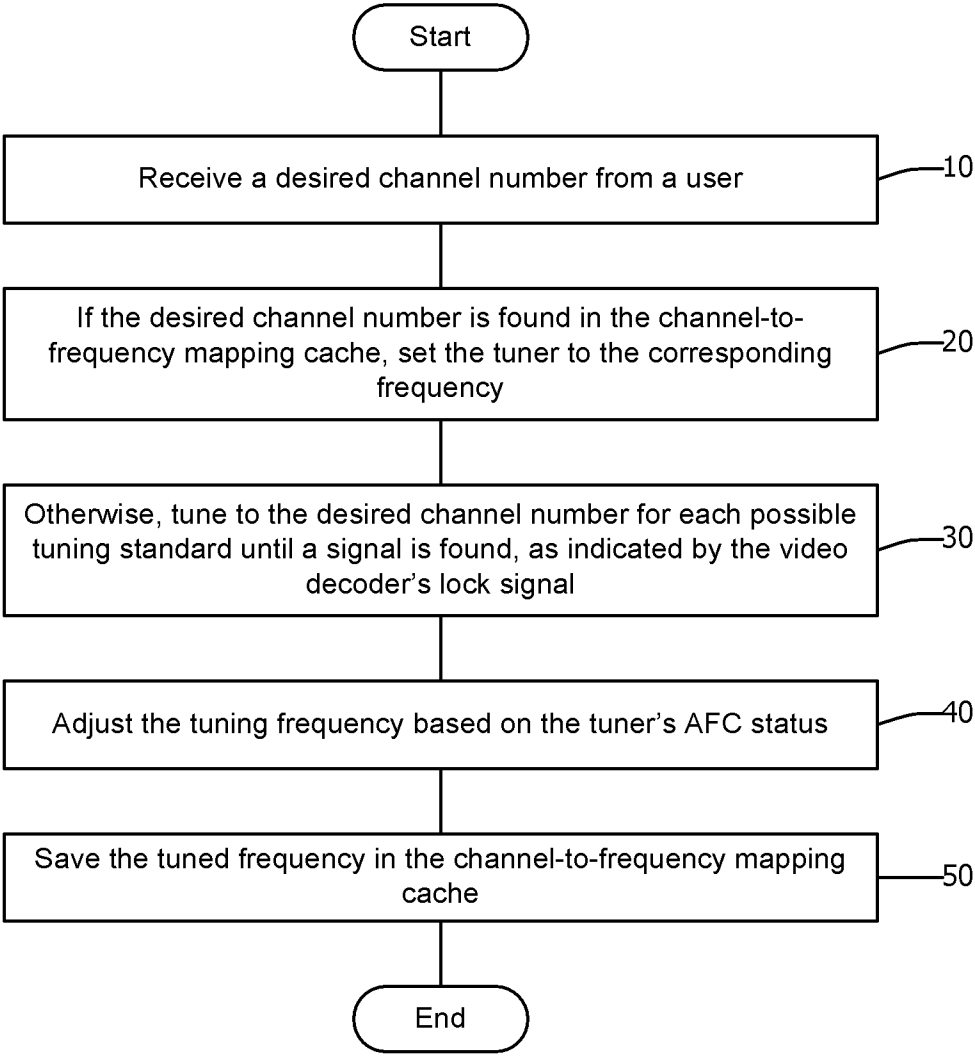
In current TV receivers, which are manufactured for a specific country, manufacturers have implemented different tuning algorithms. In most algorithms, the user is asked to specify whether an off-air antenna or a cable system is attached. If a cable system is selected, some TV receivers may prompt the user to select whether a Standard, HRC, or IRC system is in use. Other receivers assume that a Standard system is in use, since it is the most common type. In some other receivers, an algorithm attempts to automatically determine whether the system in

use is Standard, IRC, or HRC, by scanning the complete channel range to determine which channels are present. In still other receivers, the tuning algorithm determines which system is in use each time a channel selection is made by checking each possible frequency at which the channel may be located until a signal is found.

According to the present invention, a TV receiver uses the signal lock from the video decoder to determine if a video signal is present, rather than relying on the synchronizing signal from the IF circuit. The receiver does not examine any channels other than the one attempting to be tuned in order to make the determination of the type of connected system. Specifically, it does not look at channels 5 and 6 to make a determination. The receiver does not make a provisional judgment in advance on the type of system, but rather determines the system when a channel is tuned. The receiver does not require that an initial channel auto-scan be done to determine which channels have signals. The receiver does not use the AFT to determine the signal type, but instead uses the AFT to perform fine-tuning. Furthermore, the TV receiver operates properly even if an off-air signal is combined with a cable system, providing that the channel frequencies don't overlap.

As understood with reference to the Figure, the algorithm steps through each possible tuning standard until it find a signal. At 10, a desired channel number is received from a user. At 20, if the desired channel number is already present in a channel-to-frequency mapping cache of the TV receiver, the tuner is set to the frequency value that corresponds to the channel number. The cache provides quicker access to channels which have already been discovered. However, some embodiments of the TV receiver may not include such a cache. If the cache is omitted, no state is required to be maintained between channel selection, and step 10 (and step 50) are omitted. If there is no cache, or if the channel number is not found in the cache, then at 30 the receiver is tuned to the desired channel number for each possible tuning standard until a signal is found. The existence of a signal is determined by examining the video decoder's lock signal, rather than relying solely on the AFT information. In one embodiment, the first tuning standard tried is Standard cable, followed in order by off-air, IRC, and HRC. At 40, after the signal has been detected, fine tuning is performed in order to adjust the tuning frequency based on the status of the tuner's AFC. At 50, the fine-tuned frequency is saved in the cache.

The tuning algorithm advantageously requires no external information (e.g., system type) other than the desired channel number, and no initialization (i.e., no previous channel discover scan) is required. In addition, there is no need to handle channels 1, 5, and 6 in any special way.



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