

MULTI-INPUT TELEVISION RECEIVER WITH COMBINED CLAMPING AND SYNC SEPARATION

This invention relates to television receivers and particularly to receivers with plural video inputs and with clamp circuits for equalizing video levels when switching between difference sources and with a sync separation circuit for separating sync signals from the video input signal selected for display.

Television receivers having separate inputs for RF video sources, for auxiliary baseband composite video sources and for auxiliary component sources (e.g., SVHS) are known. To avoid picture flashing when switching between different sources (due to DC level differences) it is common to clamp the various sources of a common reference voltage level prior to switching. Subsequent processing of the selected video luminance component requires sync separation and, typically, this also involves additional clamping to ensure proper operation of the sync separator.

FIGURE 3 herein is an example of such a receiver. As shown, the input clamps comprises a pair of capacitors 302 and 304 for coupling the luminance signals Y1 and Y2 to respective inputs of a video selection switch 312. A reference voltage source (shown as a battery) 310 is coupled to the switch inputs via a pair of sync-tip clamp diodes 306 and 308 whereby the luminance input signals Y1 and Y2 are clamped to a sync tip level to about the potential of the reference. The sync separator 314 includes a clamp 316 provided with a reference voltage by source 318. The reference voltage of source 318 is offset by another reference voltage 310. A comparator 322 compares the clamped video provided by clamp 316 with the offset reference voltage from source 320 to provide a separated composite sync output signal.

The present invention resides, in part, in the recognition of a need for simplification of clamping and sync separation in multi-input television receivers. To this end, the luminance signal clamping in the present invention is combined with the sync separation thereby reducing the number of required clamp circuits. For a two input luminance switch, the number of clamp circuits is reduced from three to two. In general, for an N-input luminance



switch, the number of clamp circuits equals N for the combined clamping and sync separation functions.

A television receiver embodying the invention includes a plurality of luminance signal sources, each capacitively coupled to an input of a luminance signal selection switch and each capacitor being coupled to a respective clamp circuit, each clamp circuit having a reference voltage input coupled to a common reference voltage source. A sync separator is provided having a first input coupled to receive the output of luminance signal selection switch and a second input coupled to a source of reference potential derived from said reference voltage source.

In accordance with a further feature of the invention, the clamp circuits are of the "duty cycle" type. The duty cycle clamp is preferred over the sync-tip type of clamp shown in Figure 3 because it is less sensitive to variations in sync tip amplitude. It is preferred over the keyed back porch clamp because it is less complex but still yields comparable performance.

The invention is illustrated in the accompanying drawing wherein:

FIGURE 1 is a block diagram of a multi-input television receiver including combined clamp and sync separator embodying the invention;

FIGURE 2 is a block diagram of a preferred implementation of clamp circuits used in the embodiment of FIGURE 1; and

FIGURE 3 is a block diagram of a known plural input clamp and sync separation circuit.

The receiver 10 of FIGURE 1 includes an RF input terminal 12 for connection to a cable or antenna source, an auxiliary input terminal 14 for connection to a source of baseband composite video signals and an SVHS input connector 16 for connection to a source of separated luminance and chrominance signals. The RF input terminal 12 is applied to an RF processing unit 17 which produces a baseband composite video output signal. A switch 18 selects either the auxiliary input signal or the output of the RF processing unit and applies the selected signal to a luminance chrominance signal separator 20. Another switch 22 selects the chrominance signal $C1$ of



unit 20 to the chrominance signal C1 of the SVHS input connector for application to a color processing unit 24. The luminance output Y1 of the separator 20 and the luminance signal Y2 of the SVHS connector are AC coupled via respective capacitors C1 and C2 to respective
5 inputs of a luminance selection switch. The switch inputs are also applied to respective clamps 42 and 44 provided with a common reference voltage from a reference voltage source 50 (illustrated by a battery). the output of switch 40 is applied to a luminance signal processor and its output along with that of the chrominance signal
10 processor 24 are applied to a display processor 62 which performs conventional functions (e.g., matrixing, etc) and supplies a video output signal to a display 64 for displaying images of the selected video signal. Sync detection is provided by a comparator that compares the output of switch 40 with an offset voltage (provided by
15 battery 51) that is offset from the main reference voltage source 50. The resultant composite sync signal is supplied to the display processor for providing various timing functions, e.g., for deflection control.

In operation, the need for additional clamping for the
20 sync separator is eliminated by "merging" so-to-speak the clamping and sync separation functions. Advantageously, this eliminates the need for a clamp circuit as compared with the prior art previously discussed.

FIGURE 2 is exemplary of a preferred clamp circuit. As
25 previously explained, this circuit (a duty cycle clamp) is more accurate than sync tip clamps and is less complicated than back porch keyed clamps. As shown, a luminance input signal Yin is applied via a capacitor to a circuit node 202 that is either charged by a current source 206 in series with a switch to a source of positive
30 supply voltage or discharged by another current source 210. The current of source 206 is K times as large as the current of source 210. Node 206 is coupled via a buffer amplifier 212 to an output 214 for providing a clamped luminance output signal Yo. Control of switch 208 (which determines the clamping level) is provided by a
35 comparator 220 which compares a clamp reference voltage provided by source 222 with the voltage at node 204 smoothed by a low pass RC filter 224/226.



In operation the comparator senses the difference between blanking interval and active video interval (at equilibrium). By choosing the proper ratio K of the currents to approximately equal the blanking to scan time interval ratio, negative feedback is employed to cause the circuit to settle to a value wherein the blanking level is substantially equal to the reference voltage of source 222. The ratio K is selected by choosing a value greater than the line time divided by the sync tip time and which is lesser than the line time divided by the blanking interval time.

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CLAIMS:

1. A television receiver, comprising:
a plurality of luminance signal sources (Y1,Y2);
5 each said source being capacitively coupled via a
respective capacitor (C1,C2) to an input of a luminance signal
selection switch (40);
each said capacitor being coupled to a respective clamp
circuit (42,44);
10 each clamp circuit having a reference voltage input
coupled to a common reference voltage source (50); characterized by
a sync separator (54) having a first input coupled to
receive the output of said luminance signal selection switch and a
second input coupled to a source of reference potential (51) derived
15 from said reference voltage source.

2. A television receiver as recited in Claim 1 further
characterized in that each of said clamp circuits comprises a
respective clamp circuit of the duty-cycle type.

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