LB-927

A SERIES NOISE INVERTER FOR TELEVISION RECEIVER IMPULSE-NOISE IMMUNITY

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Approved

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Introduction

This bulletin describes sync circuitry which improves impulse-noise immunity because it renders the sync separator inoperative during the time a noise pulse is present. It is a form of noise inverter similar in operation to that described in LB-823, *A Noise-Inversion Circuit for Improved Noise Immunity in Television Receivers*. The circuit uses a triode which is placed in series with the sync separator and which is cut off by noise pulses, preventing current resulting from the noise from flowing in the sync separator.

Principles of Operation

The basic circuit is shown in Fig. 1. Triode V_1 is connected in series with triode V_2, the sync separator, so that the grid and plate currents of triode V_2 flow through triode V_1. The detected video signal is connected to the grid of triode V_1. It is biased using R_1 and potentiometer R_2 so that the normal video signal is in grid current but the noise pulses which are of greater amplitude cut the tube off. With V_1 cut off, V_2 is disabled, preventing the grid coupling capacitor from setting up on noise, and preventing noise pulses from appearing in the separated sync output.

The parallel combination of R_3 and the r_p of V_1 should be low to avoid excessive cathode degeneration of the sync separator because its cathode current flows through this parallel combination. For the same reason the sync-

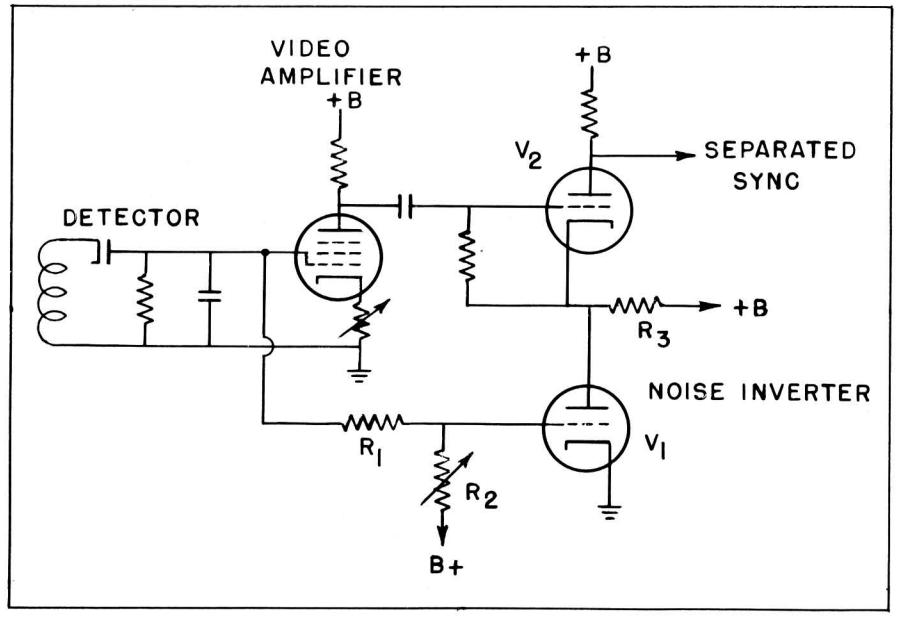

Fig. 1 – Basic circuit of series noise inverter.

separator plate current should be kept low by keeping the load resistor high and the supply voltage low. These factors will in part be determined by the requirements on the sync output voltage and waveshape.

Circuit Details

A typical circuit is shown in Fig. 2. A 12AT7 double triode is used for the sync separator and noise inverter functions. The low r_p of this tube type is desirable for minimizing the degeneration, and its high mu is desirable for good sync separator action. With the values shown, approximately 20 volts peak-to-peak of separated sync output is available, and the separation is effective down to about 12 volts peak-to-peak of composite video signal at the plate of the video amplifier.

To aid the operation of the sync separator on those noise pulses which are of greater amplitude than the sync peaks but not great enough to cut off the control tube, a fast time constant, R_5 and C_5, is added. The operation of this circuit is described in LB-813, *Improved Sync Separation in Television Receivers in the Presence of Impulse Noise*. To prevent the input capacitance of V_1 from integrating the noise pulses and so preventing them from cutting off V_1, C_1, a 15-µµf capacitor, is shunted across R_1. A 27K isolating resistor, R_4, is used to isolate the noise inverter from the video detector circuits.

To insure that slight changes in the operating point of V_1 do not cause excessive changes in the plate-to-cathode voltage and thus the sync output voltage of V_2, the plate voltage is obtained as shown in Fig. 2. Current is bled from B+ through R_7 into R_8 and R_6 to the cathode of V_2. R_8 is the sync separator load and R_6 and C_6 form a filter to prevent the positive noise pulses on the plate of V_1 from appearing in the sync separator output. Since R_7 is larger than R_8 plus R_6 and since B+ is appreciably larger than the plate-to-cathode voltage, changes in the plate voltage of V_1 cause negligible changes in the plate-to-cathode voltage of V_2.

AGC Circuit Protection

At the plate of V_1, positive noise pulses of approximately 100 volts peak-to-peak amplitude appear as V_1 is cut off. These may be coupled into the cathode of an a-g-c rectifier

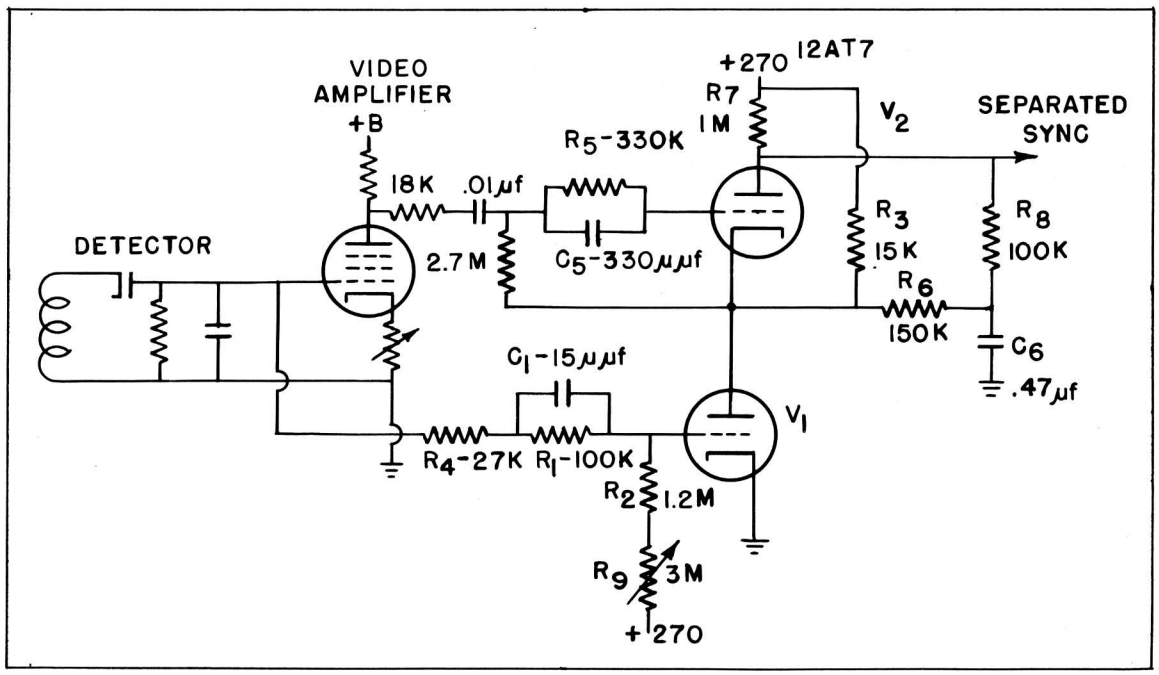

Fig. 2 – Final circuit of series noise inverter.

tube so as to cut the tube off during noise pulses and prevent setup.

As a practical matter, the noise immunity of a keyed a-g-c system with the level set for good clipping in the video amplifier is sufficiently good so that the improvement afforded by protection of the a-g-c tube with inverted noise was difficult to demonstrate. The improvement was quite noticeable when the protection was applied to non-keyed high-level a-g-c systems. In any event the noise pulses are available for use if desired.

Observations

The picture synchronized stably under noise conditions which caused complete loss of sync with the grid of the control tube shorted to ground. The setting of the level set control R_9 was relatively non-critical for moderate amounts of impulse noise, since most noise pulses were of sufficient amplitude to cut off the control tube. Using noise of high recurrence rate, and high average energy, with a relatively weak signal, improvement could be noticed as the level set control was set closer to the sync tips.

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