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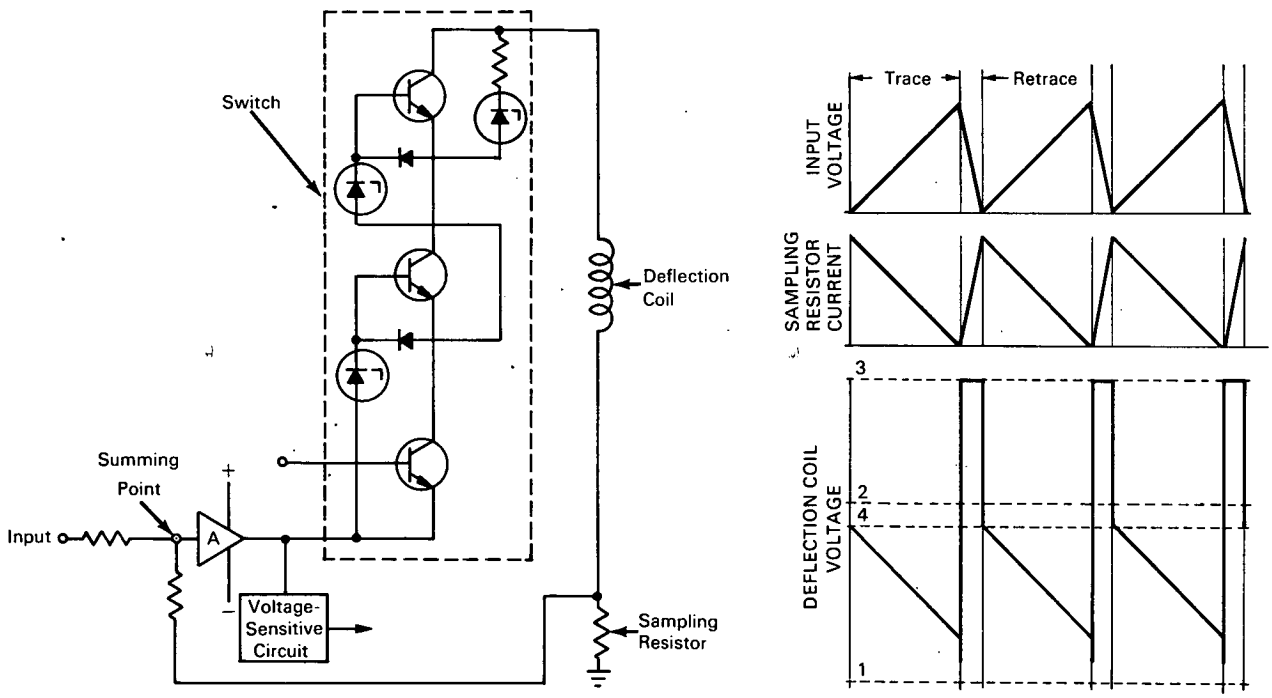
Brief 67-10468

NASA TECH BRIEF

Series Transistors Isolate Amplifier from Flyback Voltage



The problem:

To design a circuit that will allow relatively high (1.5 ampere peak-to-peak) sawtooth currents to be passed through a deflection coil (such as is used for horizontal deflection in an image orthicon) and isolate the coil driving amplifier from the flyback voltage (900 volts). This flyback voltage, or back emf, is developed when the current through the coil is suddenly reversed or stopped, as in the case of a sawtooth waveform. The retrace time of a typical sawtooth waveform is much shorter than the trace time. The flyback voltage developed during the retrace time is consequently much larger in magnitude than the voltage generated during the trace time. This flyback voltage generally exceeds the voltage handling capability of the coil driving amplifier.

The solution:

A circuit incorporating a switch consisting of transistors in series with the driving amplifier and deflection coil. The switch disconnects the deflection coil from the amplifier during the retrace time, when the high-voltage spike is developed.

How it's done:

The high-gain, dc-coupled amplifier (A) (shown in the schematic, with certain details omitted for clarity) drives the deflection coil both positively and negatively through the series switch. The deflection-coil

(continued overleaf)

current waveform is developed across the sampling resistor and fed back to the summing point. As a consequence, the current in the deflection coil is a sawtooth waveform which leads the input voltage waveform by 180 degrees. The resulting voltage waveform across the coil is shown with four levels indicated by numerals to explain the operation. Voltages between points 1 and 2 are handled by the amplifier. The portion between points 2 and 3 constitutes the high flyback voltage developed across the switch. When the amplitude of the voltage spike is at the level indicated by point 4, the voltage-sensitive circuit is triggered to generate a turn-off pulse. This pulse is applied between the bases and emitters of the transistors in the switch, turning them off. That portion of the voltage spike between points 2 and 3 is thus prevented from reaching the driving amplifier. Each of the switch transistors is kept within its collector-to-emitter voltage rating by the rectifier diodes and zener diodes connected in series between the emitters and bases of the transistors.

Notes:

1. The switch may be made up of as many transistors as necessary to provide a voltage capability greater than the flyback voltage.
2. Inquiries concerning this circuit may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   Houston, Texas 77058
   Reference: B67-10468

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: William Banks
of General Dynamics Corporation
under contract to
Manned Spacecraft Center
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