June 1971

Brief 71-10166

NASA TECH BRIEF

Ames Research Center

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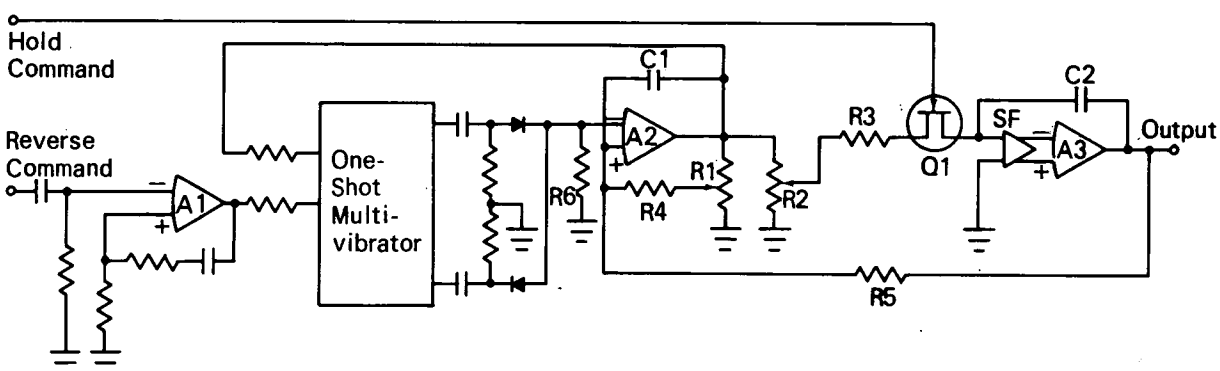
Triangular-Wave Generator with Controlled Sweep Polarity

The problem:

To develop a low-frequency triangular-wave generator for a thrust-valve control system. The generator must include variable sweep amplitude and rate adjustments, and must have the capability to hold and reverse the sweep.

When the negative hold command is applied, the switch ceases to conduct; it thus interrupts the flow of current between A2 and A3, and the output of the integrator remains constant so long as Q1 is open (i.e., it "holds"). The sweep process resumes when the hold command is removed.



The solution:

A simple generator comprised largely of integrated circuits. An operational amplifier connected as an integrator provides the linear voltage ramp, and a pair of logic gates and a one-shot multivibrator function as the sweep-reverse circuit feeding the integrator. Hold is effected by a solid state switch.

How it's done:

The sweep generator consists of a comparator, a source follower (SF), and an integrator with feedback. The holding circuit is a solid state switch Q1, interposed between the comparator A2 and the integrator A3. Potentiometers R1 and R2, respectively, control the amplitude and the sweep frequency of the integrator output. Switch Q1 is normally on.

The sweep-reverse circuit includes a one-shot multivibrator that provides a signal to the logic gates; the other gate signal is taken from the output of the comparator A2. When the output of the multivibrator is a positive pulse and it coincides with the positive half of a square wave from A2, the logic gates generate a positive pulse which is differentiated and applied to A2, thus causing the output of A2 to become negative. The inverse of this sequence leads to a positive output from A2. The logic-gate outputs thus change the state of the comparator, reversing the triangular wave shape.

Notes:

1. With selected circuit parameters, a frequency range of 0.5 to 0.0005 Hz can be achieved.

(continued overleaf)

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2. Requests for further information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: TSP71-10166

Patent status:

No patent action is contemplated by NASA.

Source: Harold Y. Wong of
Lockheed Missiles & Space Company
under contract to
Ames Research Center
(ARC-10332)