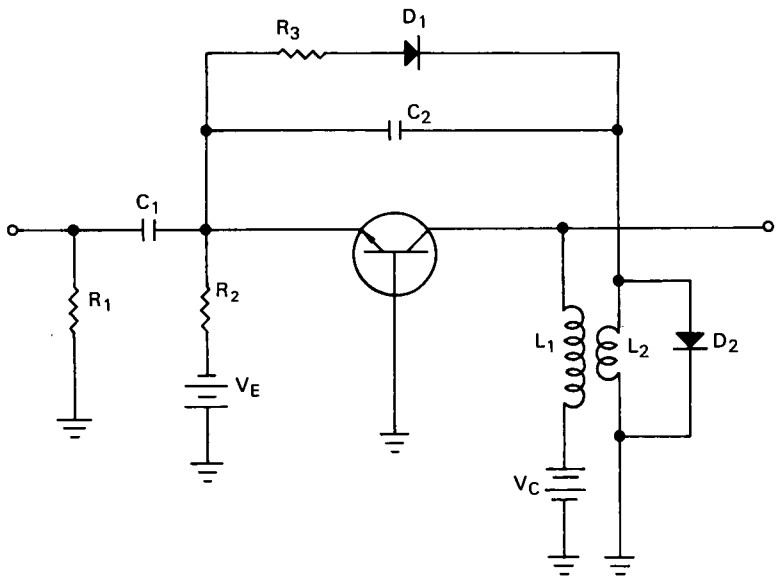
NASA TECH BRIEF

Feedback Oscillator Functions As Low-Level Pulse Stretcher



The problem: Providing a circuit capable of stretching narrow low-power trigger pulses. Conventional pulse stretching circuits used in computer memories require high-level trigger pulses. The low sensitivity of such circuits is due to the potential which must be overcome to trigger the oscillator. If the potential is reduced by forward biasing the oscillator, free-running oscillation will usually occur.

The solution: Forward biasing the transistor oscillator below the point of unity loop gain allows a low-level pulse to trigger the circuit without allowing free-running oscillation. The use of two parallel feedback loops improves the pulse stretching capabilities of the circuit.

How it's done: The pulse stretcher circuit is similar to a standard blocking oscillator. However, the high sensitivity (low trigger level) of this circuit is obtained by forward biasing the emitter-base junction of the transistor. By proper selection of R_2 and V_E, the collector bias current can be set to approximately 10 microamperes, thus keeping the loop gain below unity and preventing free-running oscillation.

When a negative input pulse is applied to the emitter of the transistor through C_1, the current in the collector circuit increases. As a result of this increase, a positive feedback voltage is coupled across coils L_1 and L_2, through capacitor C_2, to the emitter of the transistor. This positive feedback continues until the voltage across L_2 is sufficient to turn on diode D_1. The use of secondary feedback path D_1–R_3 permits pulse widths exceeding the charge time of capacitor C_2.

(continued overleaf)

In addition, the secondary feedback path allows the use of a smaller value capacitor for C_2 which increases the recovery time of the circuit. A faster recovery time also results from the inclusion of swamping diode D_2 across coil L_2.

Notes:

1. The approximate trigger requirements for such a circuit are a signal 30 nanoseconds wide at a level of 200 microamperes and 70 millivolts. Output pulses of 0.5-microsecond duration can be expected from this circuit.
2. This circuit should be of interest to manufacturers of electronic pulse equipment, particularly for use in very-low-power digital computers.
3. Inquiries concerning this innovation may be directed to:

   Technology Utlization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10069

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

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