High Noise Immunity One Shot

The problem:
In their usual configurations, multivibrators which deliver pulses of duration longer than a second contain R-C timing components which allow power supply fluctuations to pass through and act as triggers. For certain applications, it is desirable to have a multivibrator that produces output pulses of long duration but is not triggered by transients in the supply lines.

The solution:
A one-shot multivibrator circuit which includes a constant current source to isolate line noise from the timing circuitry, and a field-effect transistor to control the circuit's operational modes.

How it's done:
The constant current source, transistor Q1 in the schematic diagram, supplies current to transistor Q2 and resistor R1. The voltage across R1 is fixed by diode D1 and the $V_{BE}$ drop of Q2. Transistor Q3 is a low pinch-off FET, and is normally conducting ($V_{GS} = +0.4 \text{ volt}$) to keep the current source on. When a positive trigger pulse arrives at the input of Q4, $V_{GS}$ is driven negative approximately to $-1.0 \text{ volt}$ and the FET is nonconducting. Q1 is thus turned
off, and this turns off Q2. Resistor R1 holds the timing line at low potential while Q1 is nonconducting. When V_{qs} of the FET reaches about —0.3 volt due to the discharge of C, Q3 conducts and turns on the current source. The circuit is now back in its steady-state condition, ready for another trigger pulse.

Capacitor C1 is needed to prevent misfiring from high-frequency noise spikes on the supply line. A value of 0.01 μf is sufficient for most purposes; R_T should be much larger than R1 for proper operation. A minimum value for R_T is around 10K. Because of this limitation, the one shot is not capable of short-duration pulses (less than 50 μsec).

**Reference:**

**Notes:**
1. The circuit has a high immunity to supply line noise; for example, with a supply voltage of 15 volts, supply voltage spikes of ±12 volts will not cause misfire.
2. For the circuit shown, the supply voltage may vary from 4 to 40 volts. This wide variation in supply voltage causes only a 10% change in the timing period.
3. If R_T = 10M, and C_T = 330 μf, a timing period of about 1 hour is obtained.
4. Requests for further information may be directed to:
   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B72-10047

**Patent status:**
This invention has been patented by NASA (U.S. Patent No. 3,584,311) and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to:

Patent Counsel
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