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NASA TECH BRIEF

NASA Pasadena Office

Trigger Circuit Forces Immediate Synchronization of Free-Running Oscillator

The problem:

Many devices powered by an externally-synchronized inverter require it to operate without loss of synchronism. One example is the 2,400-Hz inverter flown on spacecraft, powering onboard gyroscopes, flight data subsystems, science data tape recorders, and telemetry systems. Any glitch fouling inverter synchronization could result in loss of significant data, a condition most likely to occur during periods of power source switchover from one unit to another.

The solution:

The free-running frequency of a new integrated-circuit (IC) oscillator may be higher, lower, or the same as that of the sync pulse and is always synchronized by the first clock pulse.

How it's done:

The oscillator is shown in Figure 1. The input triggering from the clock source resets the charge level on the timing capacitor C to a fixed positive level above ground potential. When transistor Q_1 is cut off, the oscillator operates in the free-running mode. Back-biased diode D_1 isolates the oscillator from spurious transients.

A negative-going clock pulse applied to the base of Q_1 turns it on. Capacitor C is charged from supply voltage V_S through D_1 and resistor R_1. The charge on the capacitor rises to voltage level V_R. This occurs regardless of the previous charge level on the capacitor. Since V_R is initially set at a level higher than V_{A1} (Figure 2), the output voltage shifts to ground potential. After passage of the clock pulse, the capacitor discharges to V_{A0}, causing the output

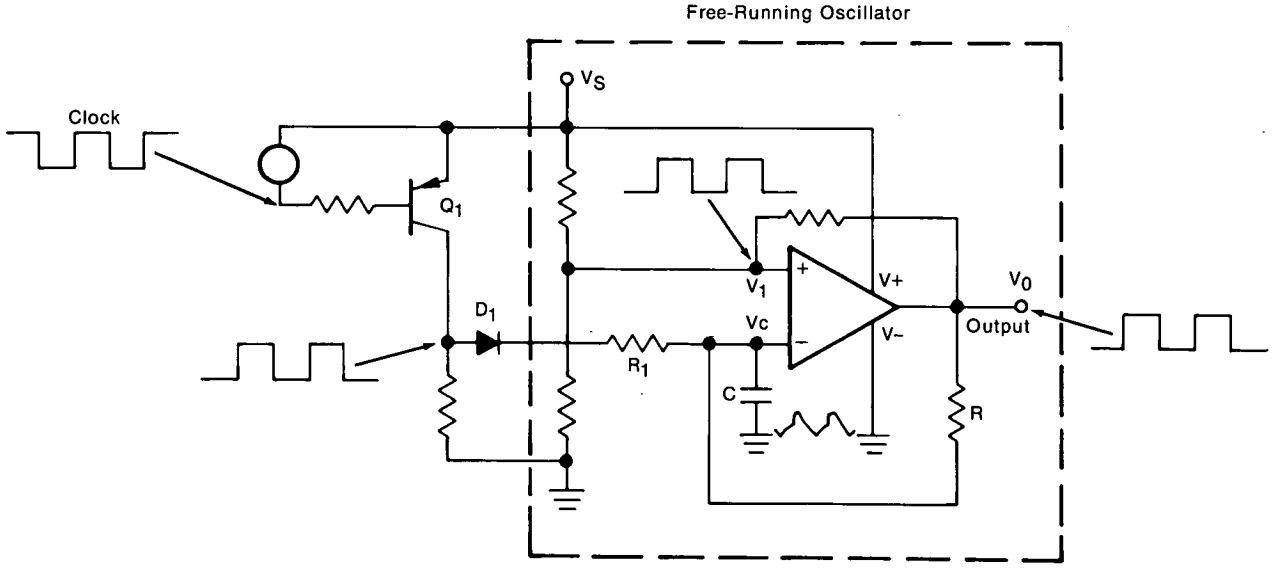

Figure 1. Trigger Circuit Forces Immediate Synchronization of Free-Running Oscillator

(continued overleaf)

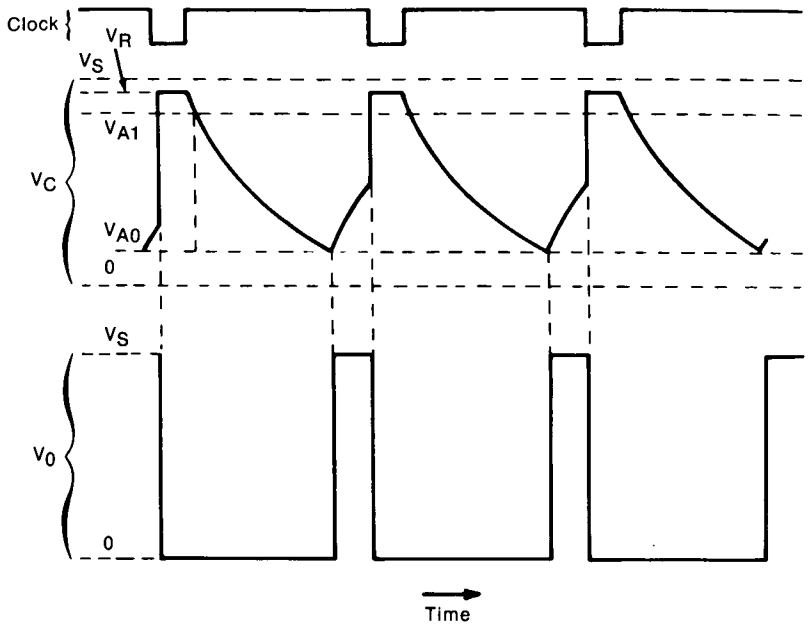

Figure 2. Synchronization Waveforms of Free-Running Oscillator

voltage to shift up to a level almost that of V_S.

The output voltage is driven to ground on the next negative-going clock pulse, and the cycle repeats. Applications of positive triggering may be useful in TV-camera and other circuits, for video recording, facsimile transmission and reception, and uninterruptible power supplies.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP75-10337

Patent status:

NASA has decided not to apply for a patent.

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Category: 01(Electronics - Components and Circuitry)