Get an ADSR waveform from a few components

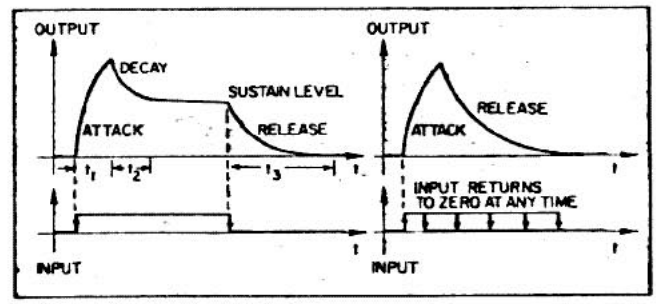
An SN 7401N TTL quad gate, three transistors and a few discrete components constitute an attack-delay-sustain-release (ADSR) waveform generator of the type used in electronic music synthesizers. The four waveform "variables" are independently adjustable over a wide range, with a maximum output amplitude of 8 V. The circuit also doubles as a simple attack-release generator for simulating percussion voicing.

A positive-going TTL input is needed to operate the circuit (Fig. 1). After being inverted (gate 4) and differentiated (2.2 kΩ, 470 pF RC network). The input signal turns on the RS flip-flop (gates 1 and 2). Capacitor C is charged via P_3, D_1, P_1, and R_1, to produce the attack time. The length of the attack time, t_1, is determined by P_1 (Fig. 2).

When the voltage across C reaches 8 V, Q_1 opens and switches off the flip-flop, initiating the decay period t_2. The length of t_2 is determined by P_2.

At a voltage level determined by P_3, D_2 conducts and C stops discharging, initiating the sustain level. This level is maintained until the TTL input signal goes low.

When the TTL input goes low, gate 3's output goes low too. Gate 3 continues the discharging of C via P_4. Release time t_3 is created and its duration is determined by P_4.

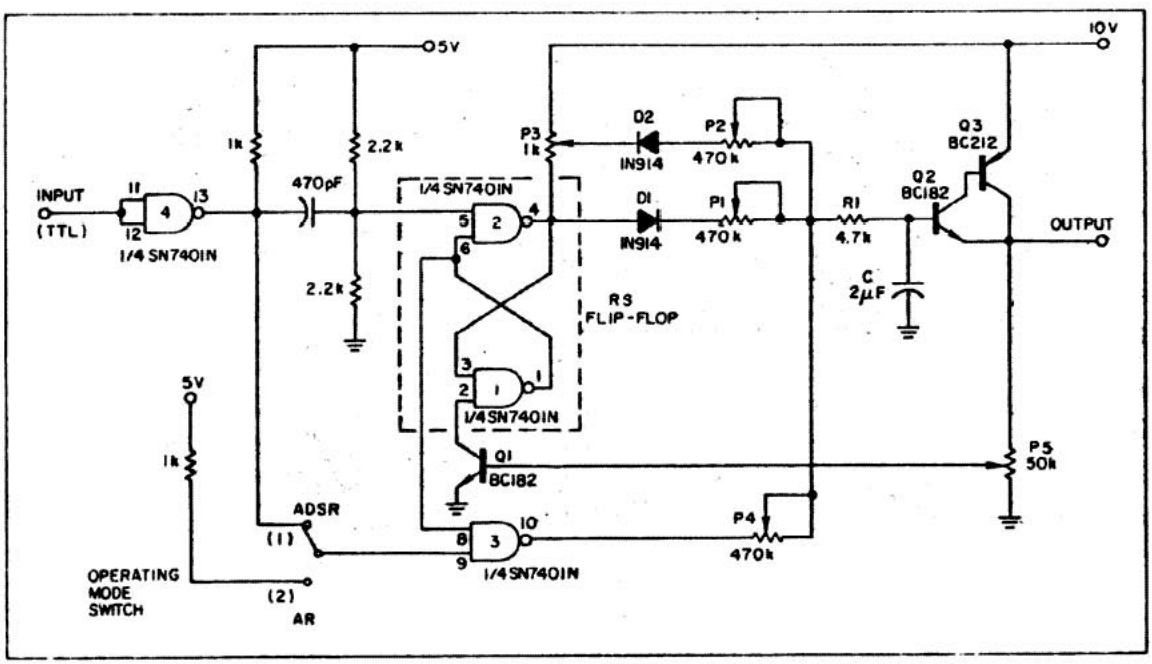


2. The circuit operates in two modes: attack-delay-sustain-release (left) or attack-release (right). The duration of the TTL input signal is significant only in the ADSR mode.

When used simply as an attack-release generator (by setting the operating mode switch in position 2), the circuit produces a waveform "envelope" suitable for percussion voicing. In this mode, the release time begins directly after the attack time, regardless of when the positive TTL input signal returns to zero.

Örley Gábor, ElectricalEngineer, 1111. Budapest, XI., Egri Jozef u.36., Hungary.

CIRCLE 311



1. The "attack," "decay," and "release" intervals of this ADSR waveform generator are independently adjustable using P_1, P_2, and P_3, respectively. The "sustain" interval is determined by the positive period of the input signal.