

## AR 312 Envelope Generator Circuit Description

The AR 312 Envelope Generator produces a waveform with four variable parameters: Attack, Decay, Sustain, and Release. When applied as a control voltage to a VCO, VCA, or VCF this waveform can provide transient information for the synthesis of sound or music.

The Envelope Generator will initiate upon receipt of a gate and trigger at its input. The output will rise to ten volts (Attack), fall from ten volts to a selected level (Decay), hold that level for the duration of the gate (Sustain), and fall to zero volts when the gate is removed (Release).

Circuit operation is as follows:

Transistors Q1, Q2, Q3, and Q4, with D1 and D3 act as a trigger enable and set the initial state of the Envelope Generator.

When Q1 receives a positive voltage (gate) at its base, it turns on and its collector drops to ground. This forward biases Q2 and its collector rises to +15. Q3 is now forward biased and its collector drops to ground reverse biasing D3. With D3 effectively an open circuit, Q4 is isolated from its positive bias and turns off. Before the gate was applied Q4 was on and acted to ground out the incoming triggers. Now, a trigger, entering the base of Q5, will initiate the Envelope Generator.

The Manual Trigger switch initiates the Envelope Generator by applying a positive voltage (gate) through D1 to the collector of Q2 and a positive pulse (trigger) through D2, C3, and R11 to the base of Q5.

A trigger at the base of Q5 turns on Q5 which turns on Q6. The collector of Q6 rises to +15. The positive voltage applied through D4, D5, D6, and R15 to the base of Q5 latches on Q5. C6 begins to charge positive through R28, R29, and D11. D9 being forward biased reverse biases D10 and isolates the Decay and Sustain circuitry from C6. A buffer amplifier, consisting of Q8, Q9, and Q10, follows the voltage on C6 and drives the output. A level detector, consisting of Q11 and D14, conducts when the output voltage reaches 10 volts. A positive voltage through D13 turns on Q4 and unlatches Q5 and Q6. D9 and D11 become reversed and C6 begins to discharge through D10, R25, R24, and Q7. When the voltage on the emitter of Q7 drops below the voltage on its base it turns off and C6 can discharge no further. When the gate is removed Q2 drops low reverse biasing D7 and allowing C6 to discharge through D8, R26, and R27. At the same time Q3 goes high reverse biasing D10 and D9 through D15 and isolating C6 from the Decay Sustain Circuitry. D12 is added to insure that C6 does not discharge below ground.