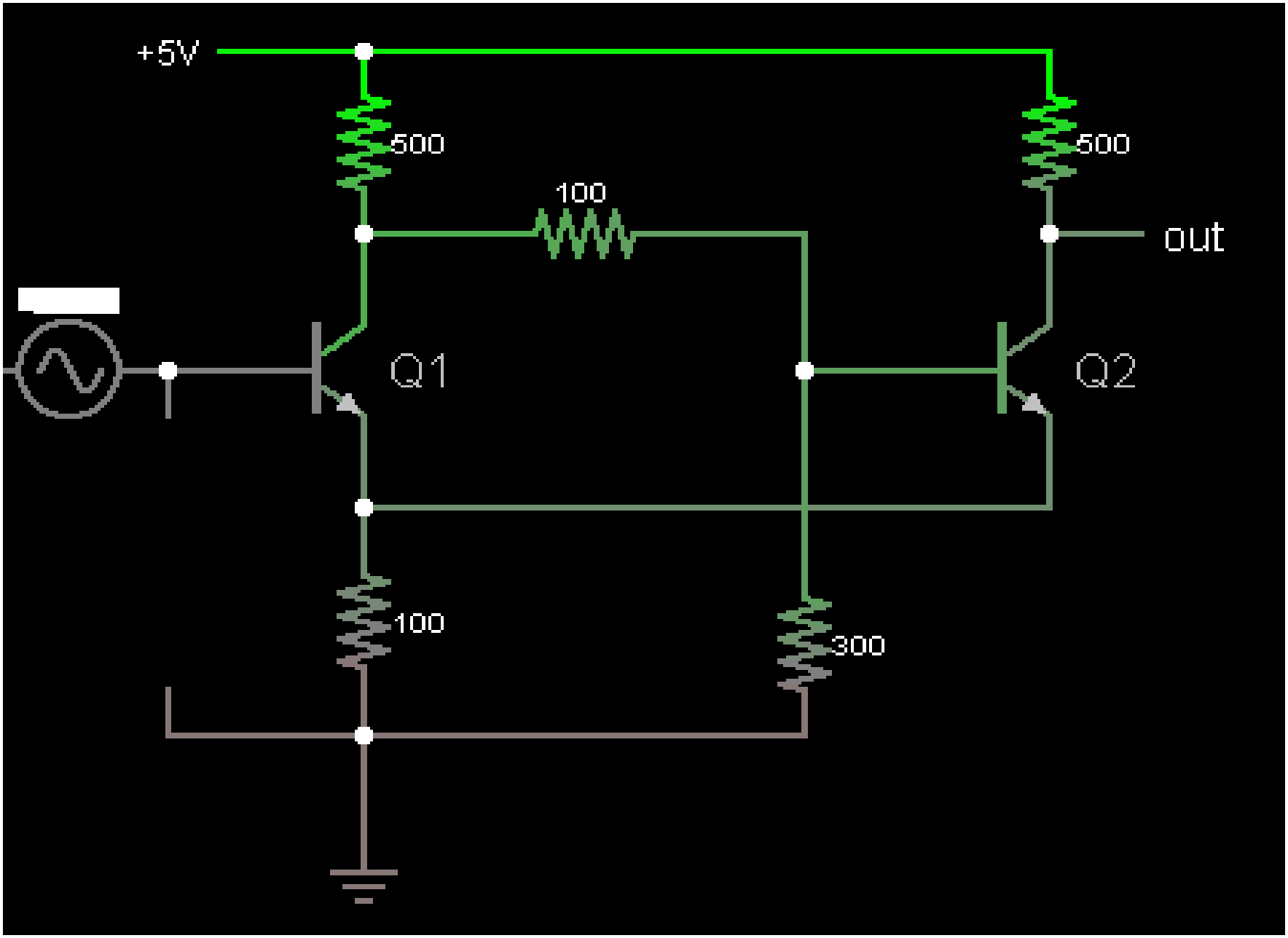
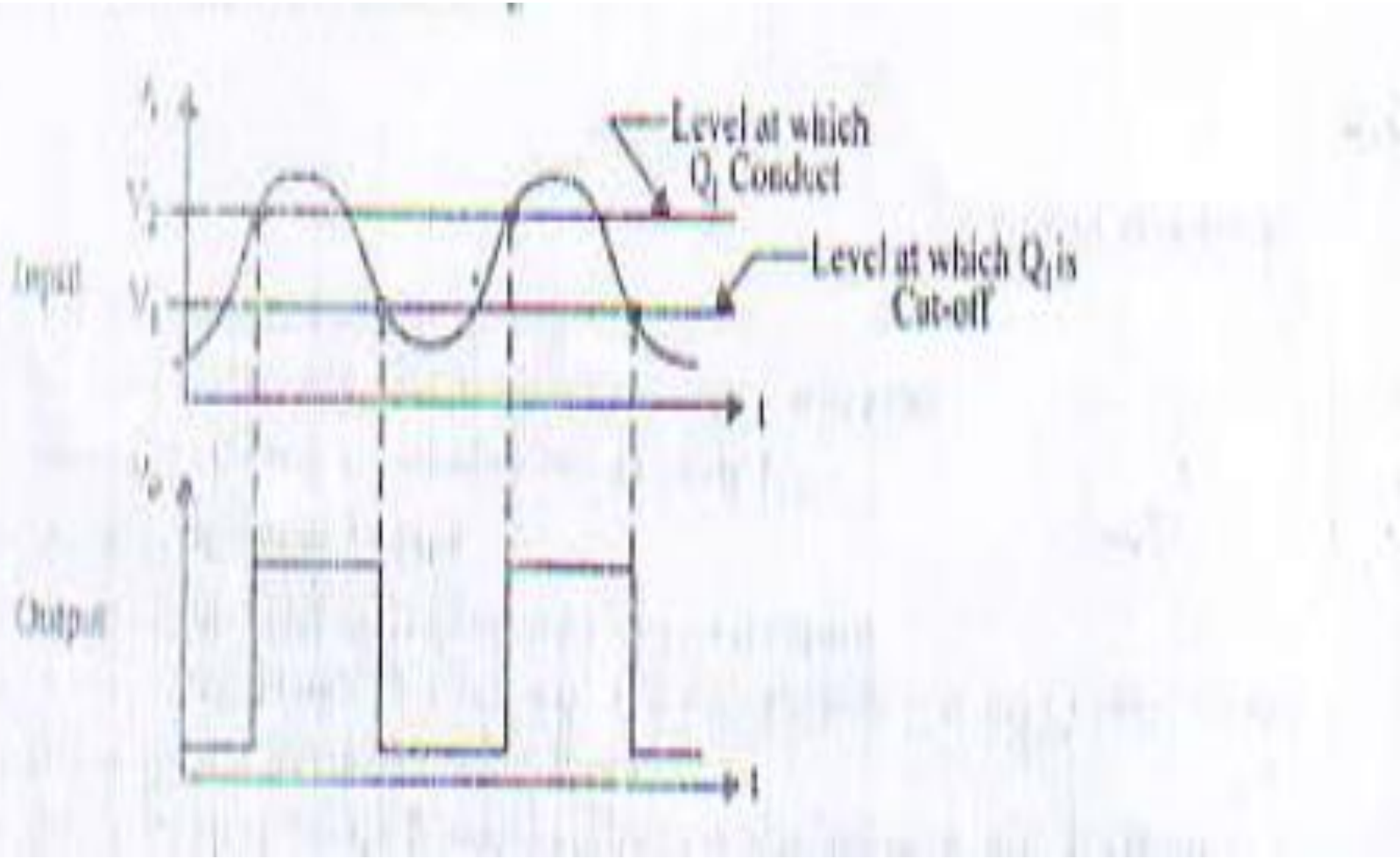
Schmitt Trigger(Squarer circuit/Level detector)

Schmitt Trigger, a type of comparator. It measures the input to see if it is above or below a certain threshold.


+5V
500
500
100
out
Q1
Q2
100
300


Level at which
Q_1 Conduct
Level at which Q_1 is
Cut-off
Input
Output
t
t

The input is a noisy 40 Hz sine wave, shown in the first scope.

Let's say the input starts at ground. A voltage divider puts Q1's collector at about 2.1 V, and Q2's base at about 1.5 V. Q2's emitter is at about 900mV, about a diode drop lower than its base. Q2 is conducting, bringing the output low

Q1's emitter is tied to Q2's, at 900mV, so Q1 will be off until the input rises to about 1.5V. Once that happens, Q1 will conduct, bringing its collector low, which will lower the voltage of Q2's base and shut it off, bringing the output high.

If the input drops slightly below 1.5V, Q1 will stay on, because Q2 is no longer keeping its emitter at 900mV. So a noisy input will not cause the output to shift rapidly between high and low.

The input has to drop below about 1.1V in order to turn on Q2. When this happens, the current Q1 is low enough that it comes out of saturation and goes into forward-active mode, and the voltage drop across it becomes large enough to turn on Q2. Q2 shuts off Q1 and brings the output low.

If the input rises slightly above 1.1V again, this will not change the output; the input has to rise above 1.5V to turn on Q1.