Calibration Procedure

Circuit description.

The LM 339 is a quad voltage comparator with open collector outputs.

Comparator U1a is configured as a Schmitt Trigger; it has hysteresis due to positive feedback via Ra and R4.

The positive going threshold is set by R5 and Rb (the output of U1b is low because Vin is below the threshold since the output of the U1a is open).

The negative going threshold is set by Ra and R4.

Thus there is no interaction when adjusting Ra and Rb.

The supply voltage is divided the voltage divider formed by the resistors R1 and R2.

When the voltage at the top of resistor R1 reaches about 14.5 Volt, the voltage Vin will be about 5.98 Volt which is the upper threshold of the of the Schmitt Trigger.

The voltage at the output of U1a, will fall rapidly due to the positive feedback to approximately 0 Volt.

The other 3 comparators are referenced to about 2.9 volt due to the voltage divider formed by resistors R7 and R8.

Therefore the outputs of these 3 comparators will change as the voltage V1 passes through 2.9 volt.

The output of U1b will go high and the output of U1a will go low.

Consequently the threshold level of U1a will change to about 5.36 volt.

The output of U1c will go low & turn on the LED.

The output of U1d will go high thus turning the FET Q1 on which operates the relay.

When the voltage at the top of resistor R1 decreases about 13.0 Volt, the voltage Vin will be about 5.36 Volt which is the lower threshold of the of the Schmitt Trigger.

Thus, V1 will go High, V2 will go Low; the LED will go & the relay will release.

Hence the circuit will return to its initial state.