

## 1. TASK

An LED should be switched on and off electrically without the use of a mechanical switch.



## 2. SOLUTION APPROACH

The switching process can be controlled via a so called PNP transistor.



## 3. EXPERIMENT DESCRIPTION

In order to limit the base current and not to destroy the transistor a base resistor R2 is used. In the output circuit of T there is an LED with resistor R3, so that the current through the LED is not too large. This resistor is already mounted on the PSITRON LED module and doesn't need to be added again on the board.



**Lab A5.1:** The two contacts K1 and K2 are not connected.

**Lab A5.2:** Touch the two contacts K1 and K2 e.g. with two lightly moistened fingers.

**Lab A5.3:** The two contacts are bridged with a magnetic wire.

## 4. OBSERVATION

**Lab A5.1:** If K1 and K2 are not connected then the base is above R1 and R2 at the positive pole and thus  $U_{BE} = 0V$ . As a result no base current and therefore no collector current flows. The LED does not light up.

**Lab A5.2:** R1 and the skin resistance at K1 / K2 form a voltage divider. The voltage is above R2 at the base of T. The LED lights up only when  $U_{BE}$  is above the threshold voltage of T.

**Lab A5.3:** If we connect the two magnetic contacts with a magnetic wire then R1 is at full operating voltage. R2 and the base-emitter diode of the transistor form a voltage divider. At the base-emitter diode a voltage drop of approximately  $U_{BE} = 0.7V$  results. The internal resistance of the transistor has dropped to its lowest value.



## LEARNING SUCCESS

The PNP transistor behaves similarly to the NPN transistor. However, in order for the internal resistance on the emitter-collector path to decrease, the base-emitter voltage must be negative relative to the emitter reference point. The PNP transistor can be used as a switch or amplifier. A small base current results in a large collector current. And small changes in the base current will cause large changes in the collector current depending on the amplification factor of T.



