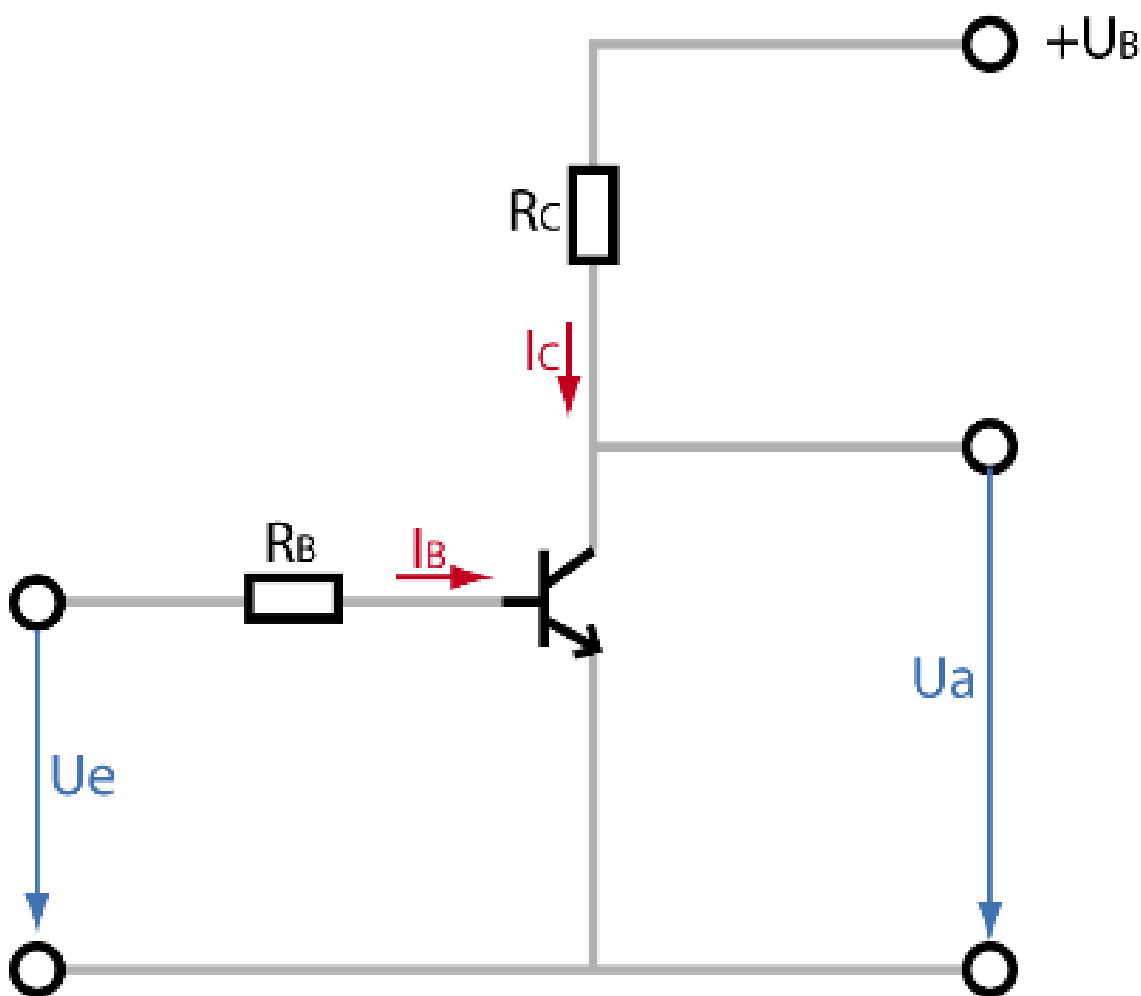


Electronic Circuits I – Laboratory 05 Transistors used as switches

#	Student ID	Student Name	Grade (10)	Instructor signature
1				
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One of the main applications for transistors is transistor switching stages. They are used for contactless, fast switching of small and medium loads. When used in this manner, the transistor is simply shifted between two states. Switching between these two states happens within a few microseconds.



Transistor switched off

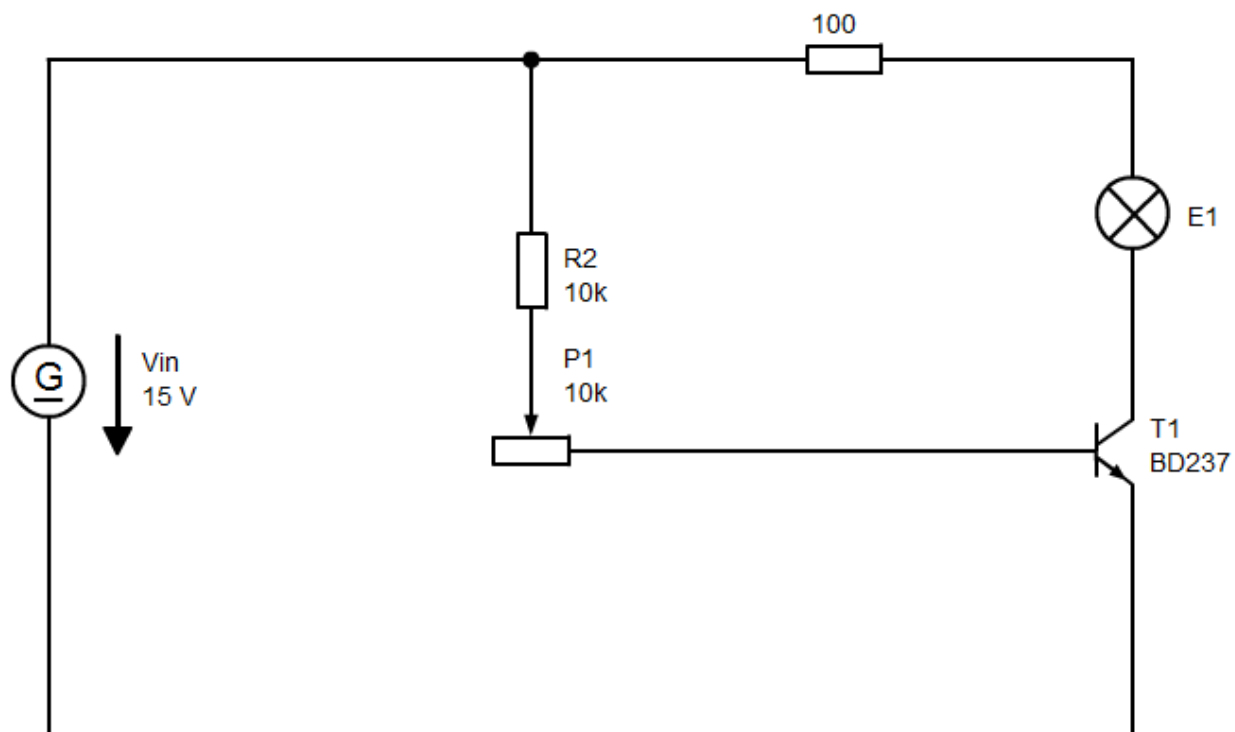
In this state, the input base current $I_B = 0$ A. In this case, the transistor is switched off and no collector current is able to flow. Because there is no voltage drop across the resistor R_C , the output voltage V_{out} corresponds to the supply voltage V_B .

Transistor switched on

In this state, a base current is fed to the transistor via R_B by applying an input voltage. This causes a collector current to flow, which must be sufficiently large that most of the supply voltage V_B drops across the collector resistor R_C . The output voltage V_{out} therefore sinks almost to 0 V. The voltage does not fall all the way to 0 V due to the fact that the resistance between the collector and the emitter of the transistor is not exactly 0 Ω . This residual voltage is also called the saturation voltage V_{CEsat} .

In order to ensure that this saturation level is achieved, a base current is supplied, which is not just the amount required for a collector current, but several times that current. As a consequence, the base is overdriven. This multiple is also referred to as the overdrive factor and, in practice, commonly has a value of between 2 and 10.

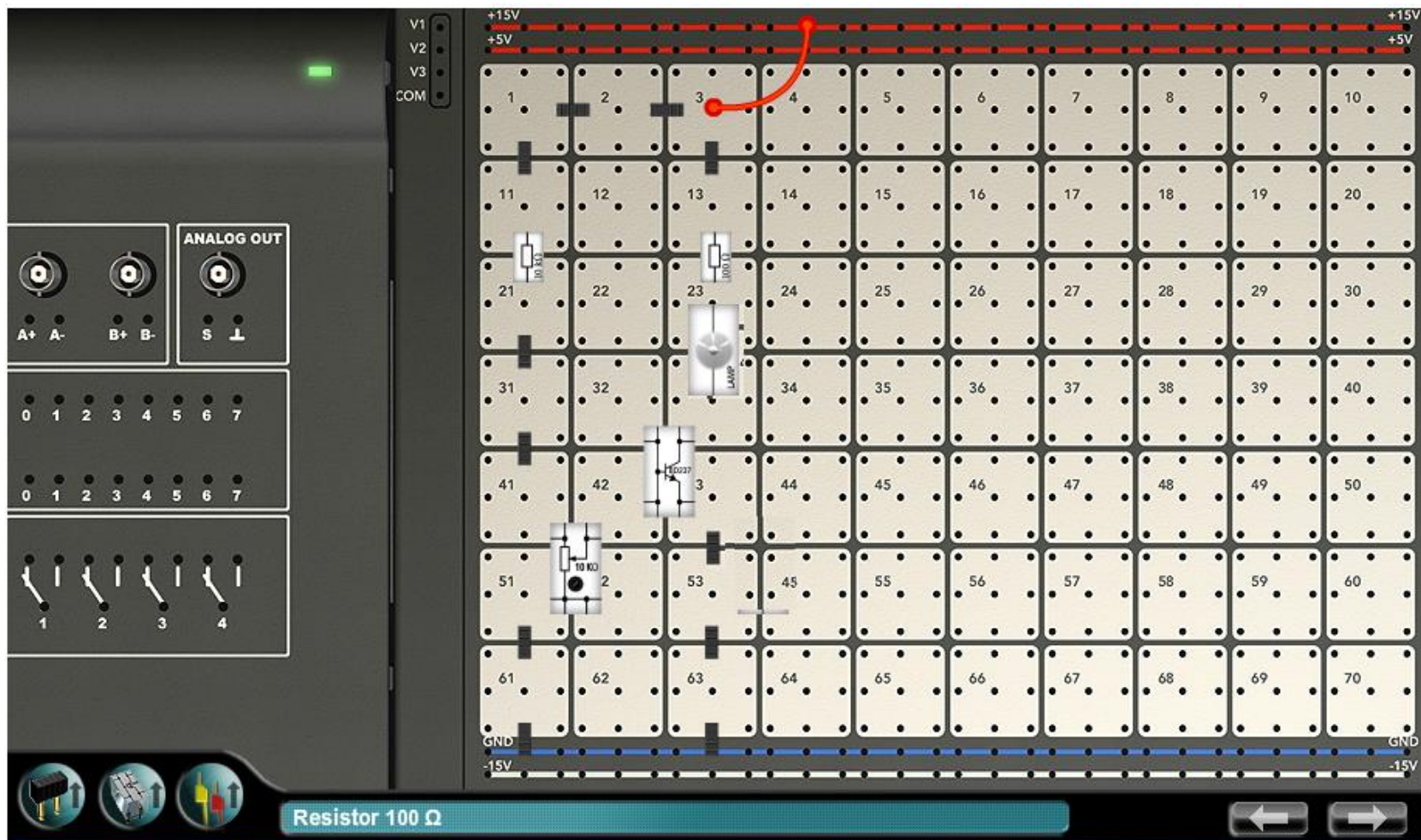
Circuit diagram



This experiment is based on the following circuit



Experiment set-up



Turn the potentiometer all the way to the right. Then gradually turn it back to the left and observe the lamp while you do so.

A	The lamp stays on all the time.
B	The lamp lights up as soon as the potentiometer has been turned slightly.
C	The lamp lights up because the base current is amplified to a multiple of its value.
D	The lamp lights up when the potentiometer has been turned all the way to the left.