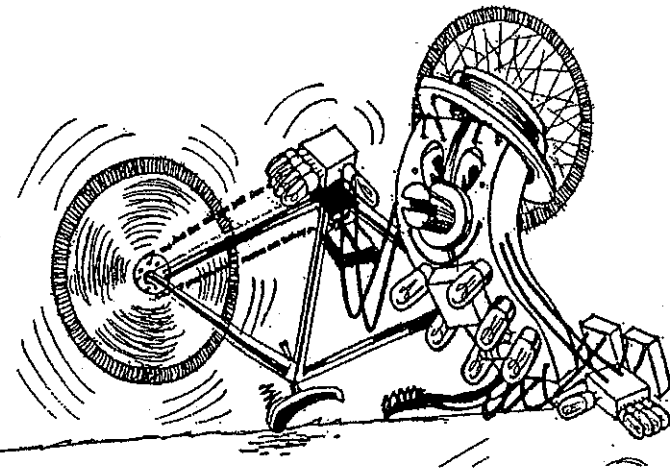


Mr. CIRCUIT[®]

Solderless Electronic Kit

HOW AN NPN TRANSISTOR WORKS

LAB KIT A8



*** START HERE ***

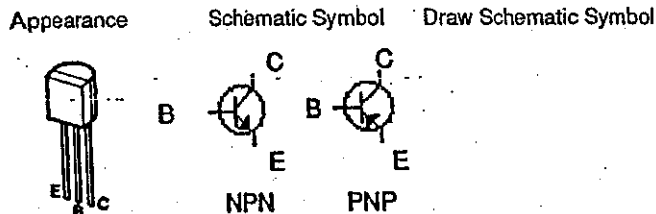
(A) PURPOSE OF THIS EXPERIMENT.

To observe how a NPN Transistor works as a current amplifier and to build a useful NPN Transistor Checker.

(B) THEORY OF THIS CIRCUIT

The transistor is a component used to amplify electricity. It has three terminals: Emitter, Base and Collector.

According to how transistors are manufactured they become NPN or PNP type. Observe the difference in the schematic symbol between these two types.



When the collector of an NPN transistor is positive, the emitter negative, and the base slightly positive, the transistor is correctly biased (polarized) and there are two currents flowing through it: the Collector Current (I_c) (flowing in the Emitter and out the Collector), which is a large current, and the Base Current (I_b) (flowing in the Emitter and out the Base), which is a small current, as shown in Figure 1.

The interesting thing about transistors, is that the Base Current (I_b) which is a small current, controls the Collector Current (I_c), which is a large current. The larger the Base Current, the greater the Collector Current.

This important process, of having a small current controlling a large current, is called AMPLIFICATION.

Figure 2 shows the circuit of this experiment. It uses a NPN transistor. Its collector receives a positive voltage from the battery through resistor R2 and LED2. The emitter is connected directly to the negative terminal of the battery and the base receives a positive voltage from the positive terminal of the battery through resistor R1, the pushbutton, and LED1.

The brightness of LED1 is proportional to the Base Current, and the brightness of LED2 is proportional to the Collector Current.

Performing the experiment, you will find that LED2 (collector LED) is brighter than LED1 (base LED). This means that the Collector Current is larger than the Base Current.

In this experiment you will also find out that if there is no Base Current (pushbutton open) there is no Collector Current. If there is a Base Current (pushbutton pressed), there is a Collector Current. This means that the Base Current, which is a small current, is controlling the Collector Current, which is a large current.

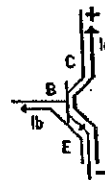


Fig 1

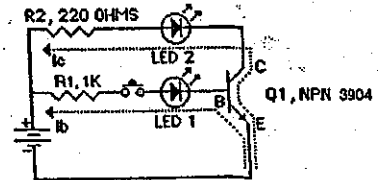
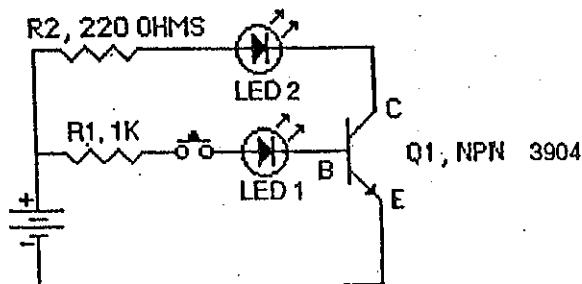
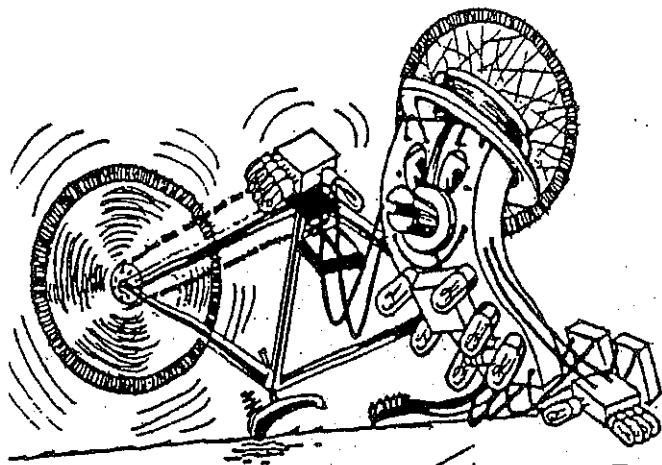


Fig 2

SCHEMATIC DIAGRAM & PARTS LIST



	Part #
- Battery Snap	SL35001
- R1: 220 ohm resistor	SL01049
- R2: 1K ohm	SL01065
- LED1 / LED2	SL06001
- Q1: 2N3904 (NPN)	SL18001
- Pushbutton	SL25004



M.CIRCUIT[®]

Solderless Electronic Kit

HOW A PNP TRANSISTOR WORKS

LAB KIT A9

*** START HERE ***

(A) PURPOSE OF THIS EXPERIMENT.

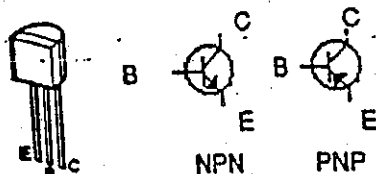
To observe how a PNP Transistor works as a current amplifier and to build a useful PNP Transistor Checker.

(B) THEORY OF THIS CIRCUIT

The transistor is a component used to amplify electricity. It has three terminals: Emitter, Base and Collector.

According to how transistors are manufactured they become NPN or PNP type. Observe the difference in the schematic symbol between these two types.

Appearance Schematic Symbol Draw Schematic Symbol



When the collector of an PNP transistor is negative, the emitter positive, and the base slightly negative, the transistor is correctly biased (polarized) and there are two currents flowing through it: the Collector Current (I_c) (flowing in the Collector and out the Emitter), which is a large current, and the Base Current (I_b) (flowing in the Base and out the Emitter), which is a small current, as shown in Figure 1.

The interesting thing about transistors, is that the Base Current (I_b) which is a small current, controls the Collector Current (I_c), which is a large current. The larger the Base Current, the greater the Collector Current.

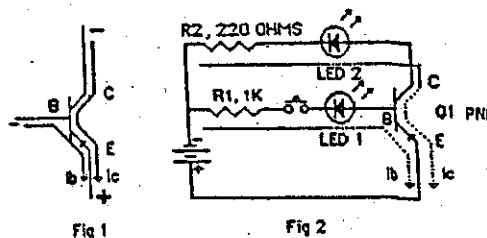
This important process, of having a small current controlling a large current; is called AMPLIFICATION.

Figure 2 shows this experiment. It uses a PNP transistor. Its collector receives a negative voltage from the battery through resistor R2 and LED2. The emitter is connected directly to the positive terminal of the battery and the base receives a negative voltage from the negative terminal of the battery through resistor R1, the pushbutton, and LED1.

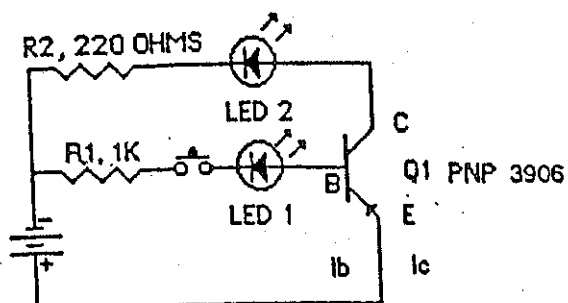
The brightness of LED1 is proportional to the Base Current, and the brightness of LED 2 is proportional to the Collector Current.

Performing the experiment, you will find that LED2 (collector LED) is brighter than LED1 (base LED). This means that the Collector Current is larger than the Base Current.

In this experiment you will also find out that if there is no Base Current (pushbutton open) there is no Collector Current. If there is a Base Current (pushbutton pressed), there is a Collector Current. This means that the Base Current, which is a small current, is controlling the Collector Current, which is a large current.



SCHEMATIC DIAGRAM & PARTS LIST



- Battery Snap
- R1: 220 ohm resistor
- R2: 1K ohm
- LED1 / LED2
- Q1: 2N3906 (PNP)
- Pushbutton

- | |
|---------|
| Part # |
| SL35001 |
| SL01049 |
| SL01065 |
| SL06001 |
| SL18002 |
| SL25004 |