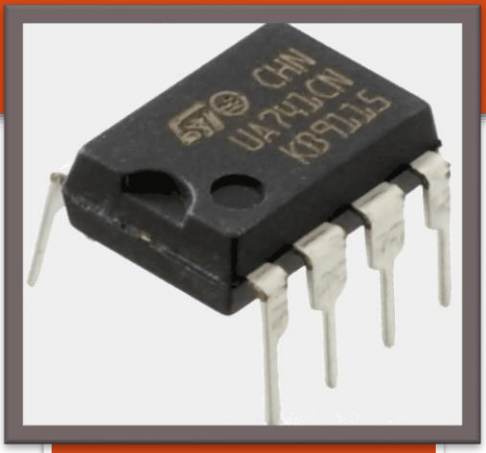
Erasmus+

E-WORLD

Better Electro-World

OPERATIONAL AMPLIFIER COMPARATOR APPLICATION - Fire Detector



BLACK TEAM-
PORTUGUESE TEAM

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THE PROJECT SUMMARY

E World (Better Electro World) is a project which is set up on the idea that VET (Vocational Education and Training) can be learned best if a student acquires vocational qualifications by the good samples of practices on peer learning and project based implementations. The main reason for this project is to lessen the educational barriers of VET which hinder a student to be successful and proactive. The idea of this project on peer learning with the good examples of project based learning comes after finding that we have a lot of common needs, problems and reasons for participating in a European partnership.

In the implementation of this project, "Learn & Do" step is improved and reinforced by taking the next step "Learn &Teach". We aim to train trainees/workers for reaching good quality with an international knowledge, vocational skills and individual competence base, relevant to working life. That will increase their employability not only in their national business but also in the EU labor market. In addition, this will set up the frame for their lifelong learning.

THE PROJECT SUMMARY1

List of materials

2 Resistors – 10K

1 Resistor- 220K

1 Resistor – 3.3 K

1 Resistor – 4.7 K

1 Resistor -560Ω

1 Resistor- 2.2K

2 Condensers – 100nF

1 Transistor – BC548A

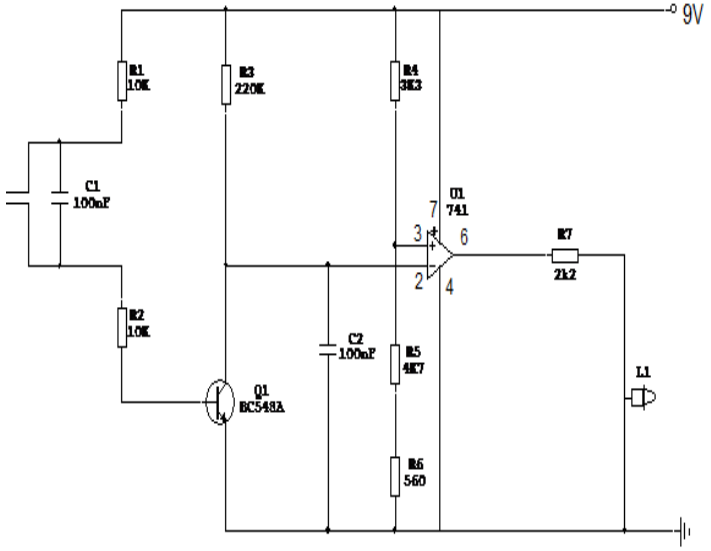
1 AmpOp 741

1 LED

1 Breadboard

Project Objective

In this project we have the objective to implement the circuit of the following figure. We have to preform measurements of the tensions in the input and outputs of the AmpOp. This circuit allow to detect in a directly form the existence of flame or water. This project can serve as a fire detector, inundation or irrigation control.



Procedure

1. Implement the circuit

2. Check its operation:
   - When doesn't exist any contact between the terminals.
   - When exist contact between the terminals connected to C1.
3. With a multimeter measure the values of the tensions in the inputs and outputs of the AmpOp in the two situations referred to above.
4. Identify the type of montage used and compare the values obtained with the theoretical values.

First Situation – Open terminals

In the first situation with the terminals open,the transistor will not have current in the base or it will be to the cut.

The inverter input (V2) of the Ampop will be 9 V ,and the non-reversing input of the Ampop which will be the (V3) will be 5.5 V

Theoretically to discover the tension that is in the exit we would have to do:

Vout = AV × (5,5 - 9) = - 350 Kv

↑

100.000

This result is impossible because it exceeds the value of the supply voltage , this means that the Ampop negatively saturates , the output voltage will be approximately the negative supply voltage.

Vout = 0V

Second Situation – closed terminals

In this second situation with the terminals closed, the transistor will have current in the base, or it will be saturated with the VCE ≈ 0V

The inverting input of the Ampop (V2) will be at 0V , and the non-inverting input (V3) it is a fixed terminal that will be at 5.5 V.

In this situation , the LED is already lit because the transistor is saturated and there is current in the circuit.

Again, theoretically the output voltage would be:

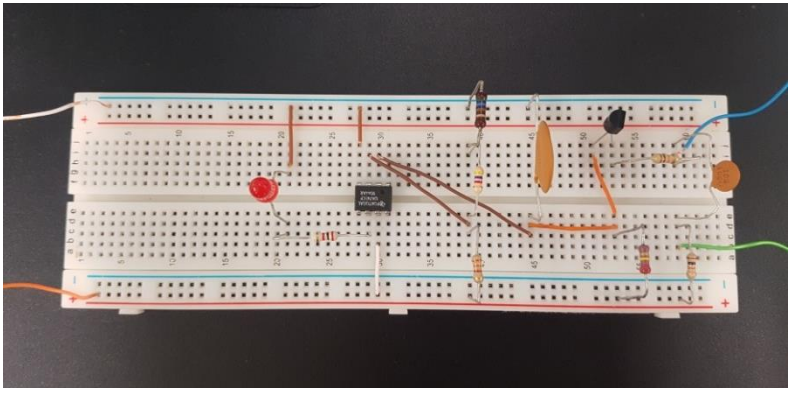
$Vout = AV \times (V3 - V2^{-}) \Rightarrow Vout = 100000 \times (5{,}5 - 0) = 550000V$

100.000

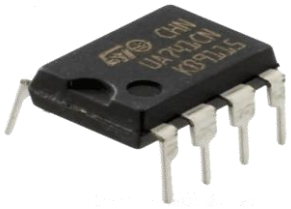
This result would again be impossible because it gave a value much higher than the supply voltage.

The positive result unlike the first situation , Ampop will saturate positively and will have an output voltage approximately equal to the positive supply voltage.

Vout = 9V



Operational Amplifier Comparator



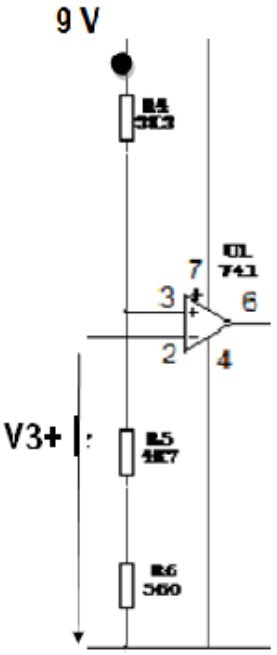
The operational amplifier known abbreviated as AmpOp is a multi-stage circuit with differential input, which produces high voltage gain, has high input impedance and low value output impedance.

This Ampop is applied in a comparator assembly, which due to the fact that it has no feedback, has no gain control.

The terminal (+) will have the fixed voltage value, in this case the 5.5 V, and the terminal (-) will be the inverter terminal , whose voltage will vary according to the situation.

If the Ampop saturates positively , is due to the fact that (+) terminal have a value greater than the (-) terminal , otherwise the Ampop will saturate negatively.

Theoretical calculation of V(3)+:



This would be the fixed voltage value of the Ampop terminal (+).

$$V3+ = \frac{R5 + R6}{R4+R5+R6} \times 9V = \frac{4,7 + 0,56}{3,3 + 4,7 + 0,56} \times 9 = 5,5\ V$$

Practical part

Closed terminals:

Pin2- 0 V

Pin3- 5.5 input with fixed value

Pin6- 8 V - is the value of the supply because the ampop saturates

Open terminals:

Pin2 - 8 V

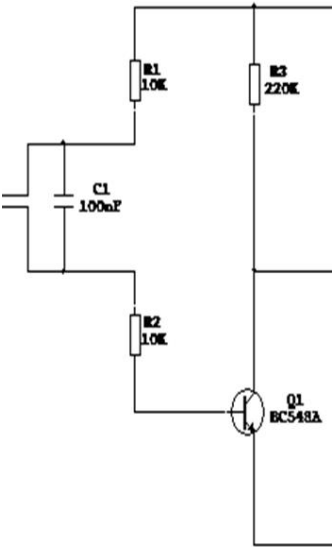
Pin3- 5.5 V

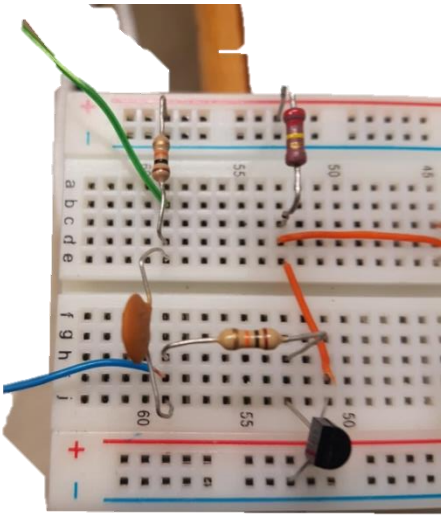
Pin6- 2 V

STEP 1- ORGANIZING THE MATERIALS

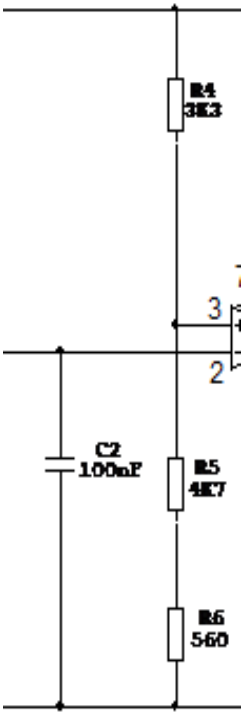
We have to collect all the components, and make sure you have the right values.

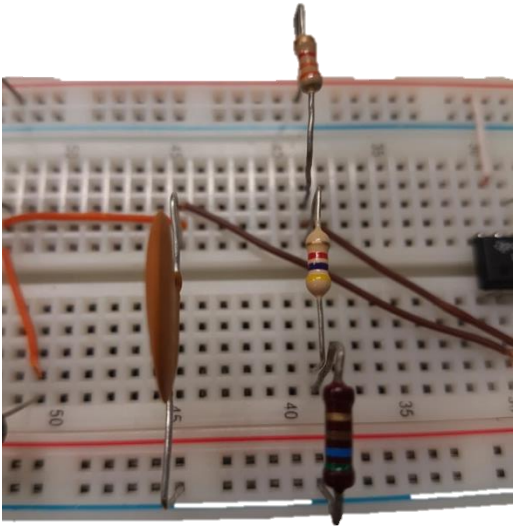
STEP 2 – MOUNT THE MATERIALS TO THE BREADBOARD – First Line



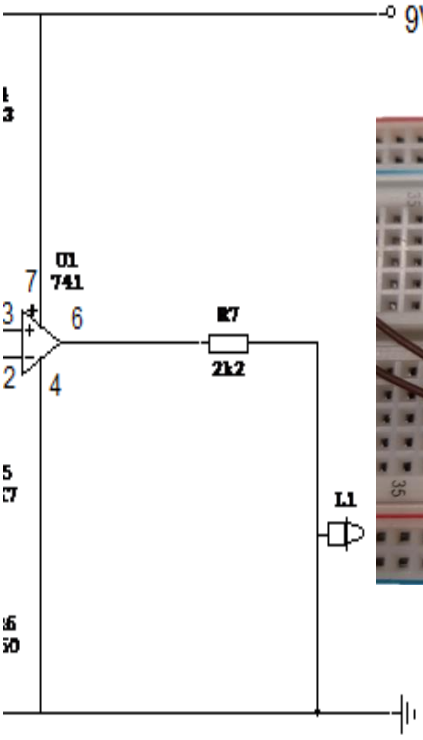


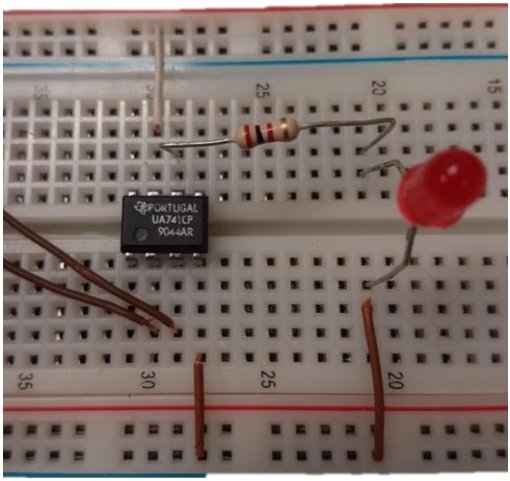
STEP 3 – MOUNT THE MATERIALS TO THE BREADBOARD – Second Line



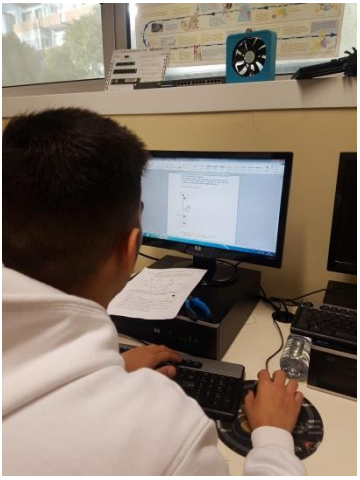


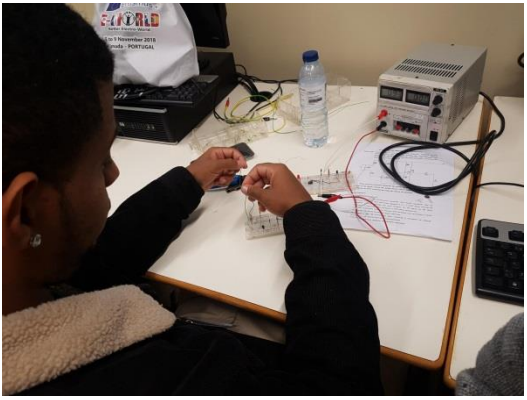
STEP 4 – MOUNT THE MATERIALS TO THE BREADBOARD – Third Line

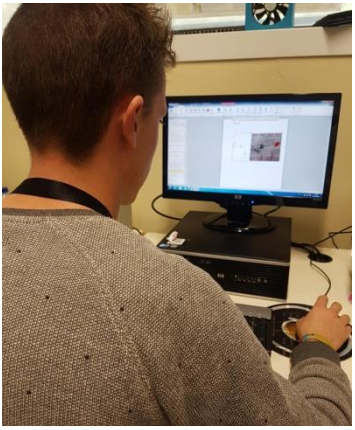




WORKING PHOTOS







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Hi, I am Miguel .
I am a student from Portugal from the course Eletronic Automation and Computers in Emidio Navarro.

Better Electro-World is my first Erasmus Project.
Better Electro-World excites me more because it is entirely related to my profession. I know new people and new cultures.

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Hi, I am Gonçalo, I study at the Emidio Navarro school, in the course of Eletronic Automation and Computers.

It is my first ERASMUS Project.

With this project I met new people, new cultures and some new sweets.

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Hello, my name is Rafael Flor.

I'm a 12th grade student.

The biggest dream since childhood is to be a good electrical engineer

I participated in this project Erasmus+ which started in our school and whe learn both about electricity and to teach it. I think this project is a useful project because whe can met people form another country ,learning new cultures is a very good thing. I recommend everyone to participate.

By the way its not my first project in Erasmus + since my 10th grade that whe do projects with Erasmus+

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Hi, I'm Miguel,
I am studying at Emidio Navarro from Almada Portugal, my course it is Electronic Automation and Computers.
I love fix fink´s and explore electronic circuits.

Better Electro-World it is a good program from Erasmus + because I can meet new people, they can explain different who they fix.