

Ahsanullah University of Science & Technology

Department of Electrical & Electronic Engineering

Project(Hardware): Temperature Controlled DC Fan

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Submitted by

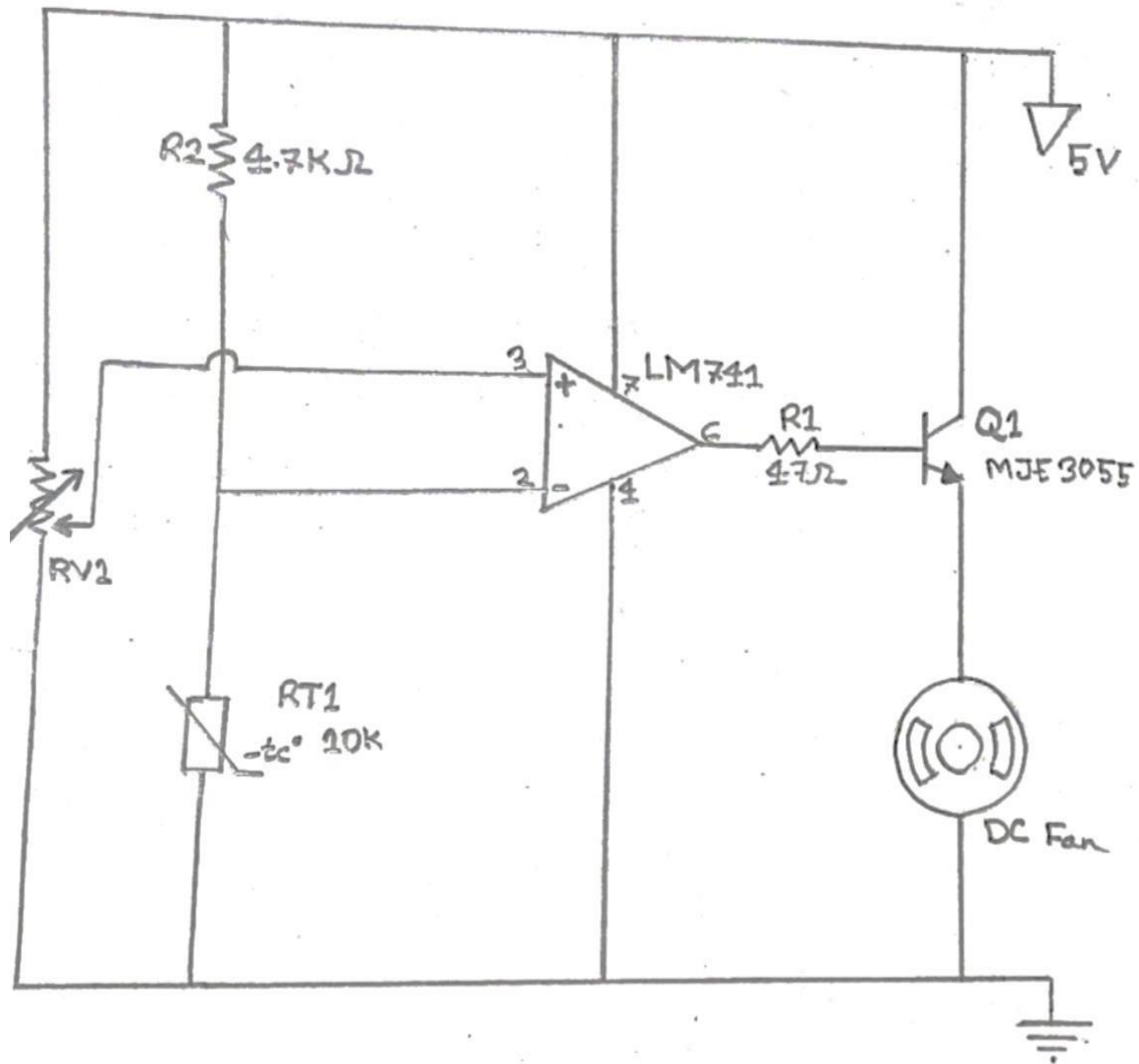
ID	Name	Email
190205180	Sha Syed Taki	190205180@aust.edu
190205181	Ananta Barua	190205181@aust.edu
190205182	Rifat Bin Arif	190205182@aust.edu
190205183	Md. Ekramul Hasan Sharon	190205183@aust.edu
190205184	Hashin Israq	190205184@aust.edu

Introduction: Temperature Controlled DC Fan is basically a temperature-based fan. It cools the devices by operating a dc fan when the temperature in its surrounding area increases above the preset level. The operation of a Temperature Controlled DC Fan is fully automatic. It turns off automatically when the temperature returns to normal.

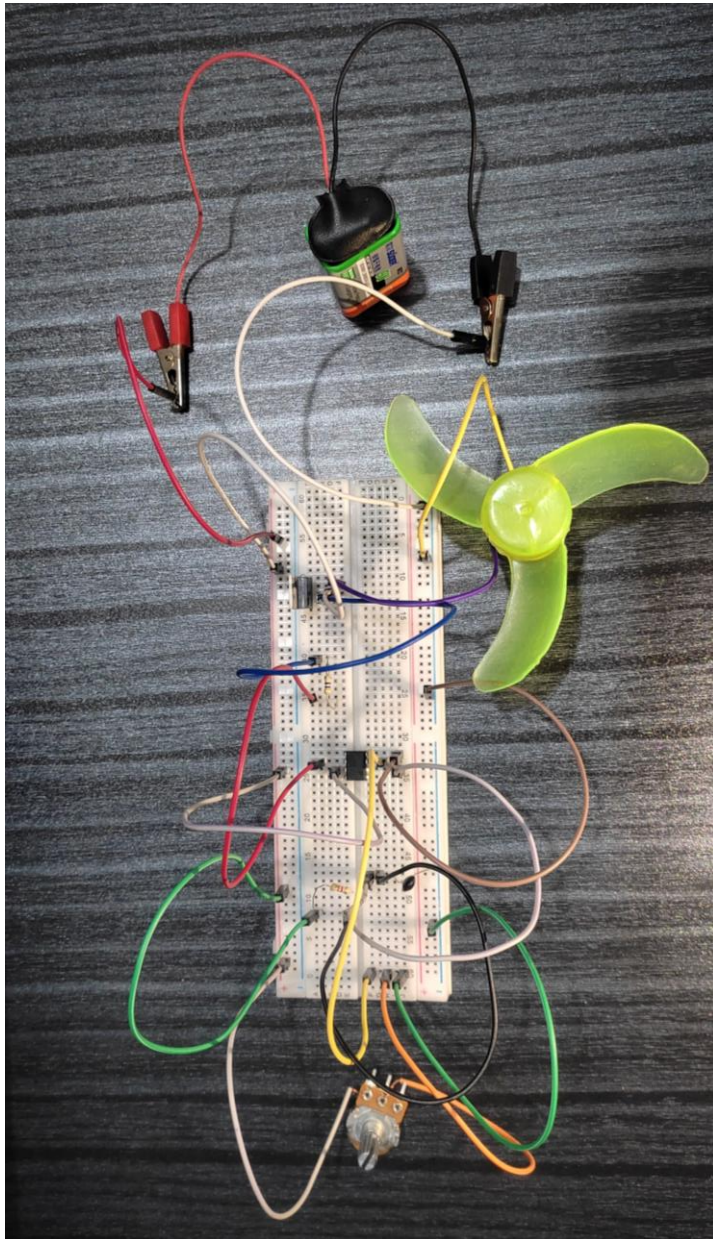
Equipments:

- Op amp IC LM741
- NPN Transistor MJE3055
- NTC Thermistor - 10k
- DC Fan (Motor)
- Resistors - 47 Ohm, 4.7k
- Potentiometer – 10k
- DC Battery-5v
- Breadboard
- Connecting wires

Circuit Diagram:

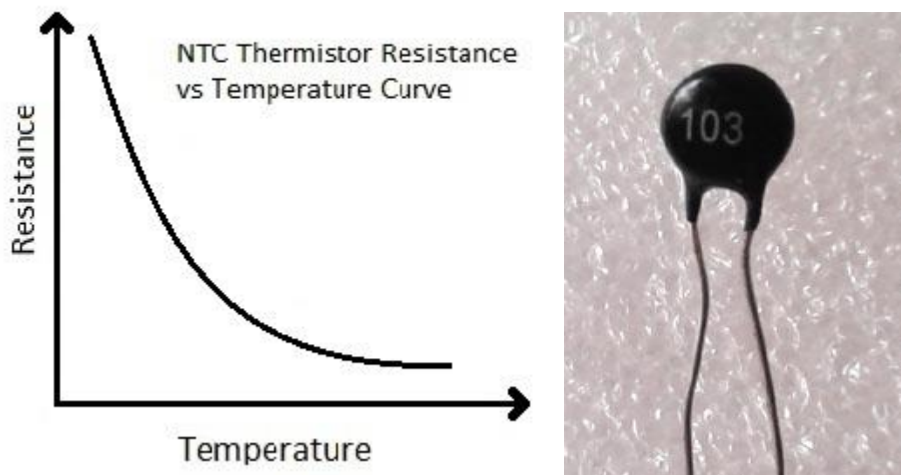


Circuit Setup:



Thermistor: The key component of this temperature controlled fan circuit is Thermistor, which has been used to detect the rise in temperature. Thermistor is temperature sensitive resistor, whose resistance changes according to the temperature. There are two types of

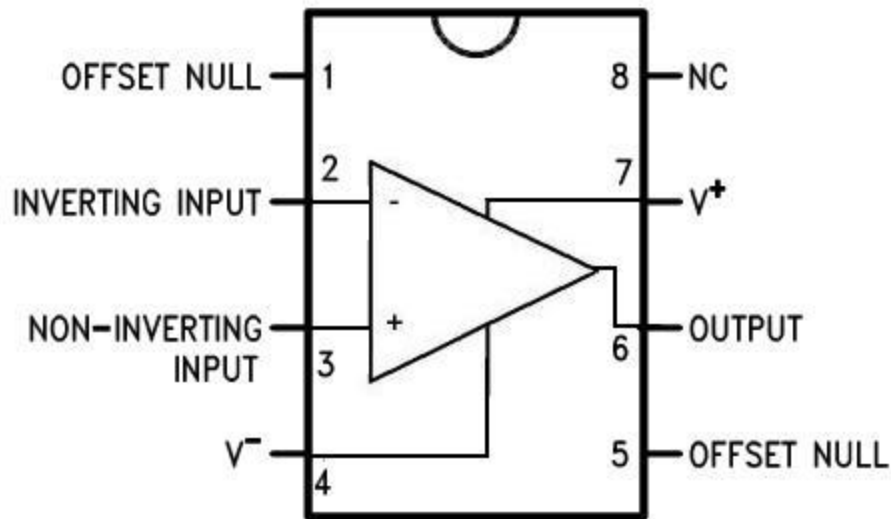
thermistor NTC (Negative Temperature Co-efficient) and PTC (Positive Temperature Co-efficient), we are using a NTC type thermistor. NTC thermistor is a resistor whose resistance decreases as rise in temperature while in PTC it will increase the resistance as rise in temperature.



IC LM741: An operational amplifier is a DC-coupled high gain electronic voltage amplifier. It's a small chip having 8 pins. An operational amplifier IC is used as a comparator which compares the two signal, the inverting and non-inverting signal. In Op-amp IC 741 PIN2 is an inverting input terminal and PIN3 is non-inverting input terminal. The output pin of this IC is PIN6. The main function of this IC is to do mathematical operation in various circuits.

Op-amp basically has Voltage Comparator inside, which has two inputs, one is inverting input and second is non-inverting input. When voltage at non-inverting input (+) is higher than the voltage at inverting input (-), then the output of comparator is high. And if the voltage of inverting input (-) is Higher than non-inverting end (+), then output is LOW. Op-amps have large gain and usually used as Voltage Amplifier. The application of this IC mainly includes an adder, subtractor, voltage follower, integrator and differentiator. The output of the operational amplifier is the product of the gain and the input voltage.

LM741 Pinout Diagram



DC Motor: A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.



NPN Transistor MJE3055: A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals. Because the controlled output power can be higher than the controlling input power, a transistor can amplify a signal.



Working Principle: Temperature Controlled DC works on the principle of thermistor. In this circuit, PIN 3 (non-inverting terminal of op amp 741) is connected with the potentiometer and PIN 2 (inverting terminal) is connected in between of R2 and RT1 (thermistor) which is making a voltage divider circuit. Initially, in the normal condition the output of the op amp is LOW as the voltage at non-inverting input is lesser than inverting input which makes the NPN transistor remains in off condition. The transistor remains in OFF condition because there is no voltage applied to its base and we need some voltage at its base to make the NPN transistor conduct.

When the temperature is increased, the resistance of Thermistor decreases and the voltage at non-inverting terminal of op-amp becomes higher than the inverting terminal, so the op amp output PIN 6 will become high and transistor will be ON (because when the output of opamp is high the voltage will flow through the collector to emitter). Now this conduction of NPN transistor allows the Fan to start. As the thermistor return to the normal condition the fan will automatically turn OFF.

Advantages:

- Easy to handle and economical
- Fan starts automatically, so it can control the temperature manually.
- Automatic switching will save the energy.
- For cooling heat dissipating devices, installation is easy.

Applications of Temperature Controlled DC Fan:

- Cooling fans for laptops and computers.
- This device is used for cooling the car engine.