

# **Automatic Rain Sensing Wiper**

## **Group no:**

Group 2-G11

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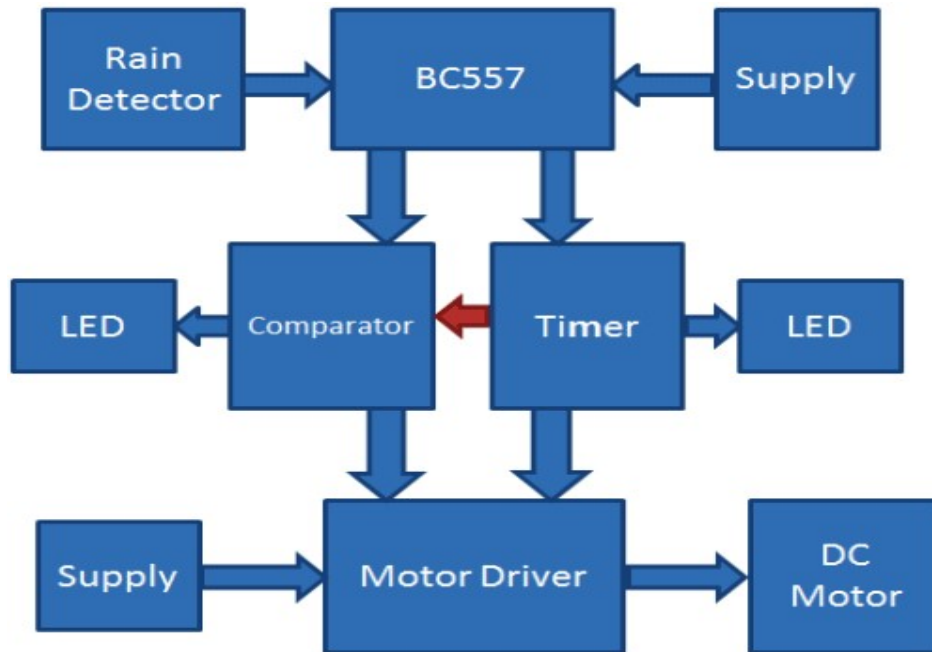
## **INTRODUCTION:**

The automatic rain sensing wiper system comprises several key components including the 555 timer IC, LM358 comparator, L293D motor driver, and rain sensor. This system is designed to activate wipers when rain is detected by the rain sensor, providing a convenient and automated solution for maintaining visibility during inclement weather.

## **LITERATURE REVIEW:**

This can be divided into four parts:

First part includes 555 Astable IC timer, second part includes Comparator LM358, third part has Motor Driver circuitry using L293D and forth part Rain Detector.



#### COMPONENTS AND THEIR DESCRIPTION:

- 555 Timer IC.
- L293D.
- IC LM358.
- Transistor BC557.
- Resistors (1K, 10K, 2.2M).
- Capacitors (0.01uf, 0.47uf).
- DC Motor.
- Rain Sensor.
- Power supply (5-12v).

#### Astable Multivibrator mode of 555 timer IC :

It is also called Free running or self triggering mode Unlike Monostable multi vibrator mode it doesn't have any stable state, it has two quasi stable state (HIGH and LOW). No external triggering is required in astable mode, it automatically interchange its two states on a particular interval, hence generates a rectangular waveform. This time duration of HIGH and LOW output has been determined by the external resistors (R1 and R2) and a

capacitor(C1). Astable mode works as a oscillator circuit, in which output oscillate at a particular frequency and generate pulses in rectangular wave form.

Using 555 timer IC, we can generate precise time duration of HIGH and LOW output, from micro seconds to hours, that's why 555 is very popular and versatile IC.

### **METHODOLOGY:**

The circuitry involves configuring the 555 timer IC in astable multivibrator mode to generate oscillations, utilizing the LM358 comparator to control the direction of the DC motor via the L293D motor driver based on the output of the timer IC, and integrating the rain sensor to trigger the system when rain is detected.

Additionally, this includes the construction of the rain sensor using a copper clad board, black tape, and Ferric chloride solution

For Astable Multivibrator, we have used a 555 Timer IC for generating pulse in every 2-3 seconds (depends on capacitor value), means 555 Timer IC is configured in Astable mode. Output of Astable Multivibrator is directly connected to inverting pin of Comparator LM358 and Pin No 7 of Motor driver L293D. Output of comparator is directly connected at pin 2 of motor driver IC. Comparator LM358 IC is used here for comparing 555 timer IC's output voltage and reference voltage across comparator's non inverting terminal, set by using Voltage Divider Circuit (R3 and R4). Two LEDs have been used, one at the output of 555 Astable circuit and other at the output of comparator LM358. A Water Detector or Rain Sensor is used for detecting the water or rain. Output of Astable Multivibrator and Comparator is applied to motor driver IC L293D, which will further drive the wiper motor. Whole circuit can be powered using 5v-12v battery depending upon the application.

### **WORKING AND ANALYSIS:**

As we already explained that this circuit has four parts namely Astable Multivibrator, Comparator, Motor Driver and Rain Detector. When water drops of rain falls over the Rain Sensor then it will trigger the PNP transistor BC557 and PNP transistor turns ON the power supply of whole circuit and circuit start working until there is water on the Rain Sensor. Now after the power supply has been turned on , Astable Multivibrator starts oscillating in configured frequency. The Arduino initializes its pins and set up the necessary Now when the output of 555 Timer IC goes HIGH then the comparator LM358 gives LOW output and when the output of 555 IC goes LOW then the Comparator's output goes HIGH. And by using these two outputs DC motor turns clock wise and anticlockwise and wiper attached to it turns right to left and left to right, through Motor Driver IC L293D. That is how the wipers automatically sense rain and gets activated. They remain activated until there is water on Rain sensor, as soon as the water evaporates wipers get stopped. Two LEDs are also used here used for indication.

**Rain Sensor** is also called Rain Detector or Water Detector. steps to build the Rain Sensor:

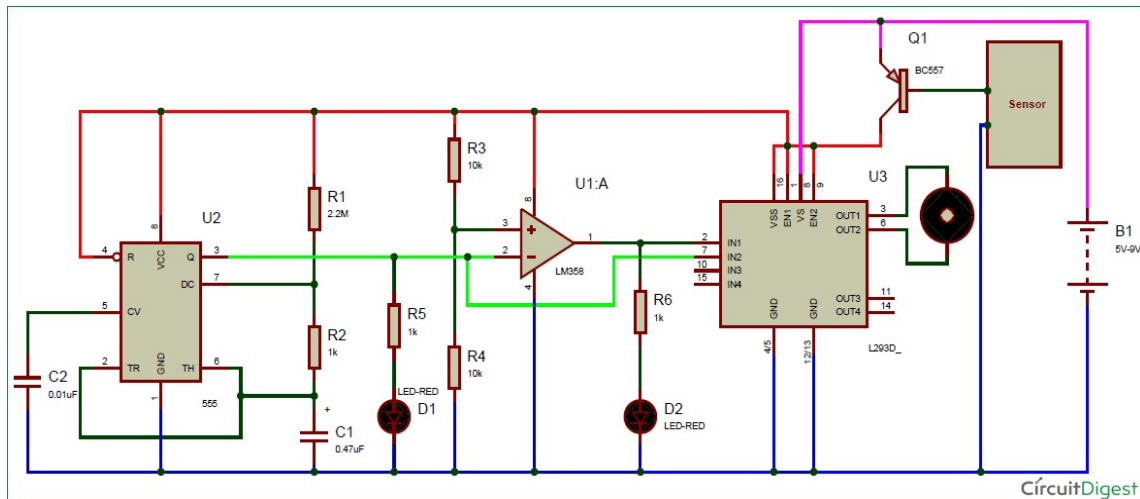
**Step 1:** Take Copper Clad Board of approx. 2 inch of length and same width and rub it by using the sand paper.

**Step 2:** Now take the Black tape or Cello tape and stick it to the Clad board.

**Step 3:** We only need copper tracks under the black tape. So we need to remove all the other copper except under the black tape. For this, make **Ferric chloride solution (FECL<sub>3</sub>)**, by adding 2-3 tea spoon of Ferric chloride in some water. This solution is called **Itching Solution**. Put the PCB in this solution for approx. half an hour.

**Step 4:** Ferric chloride will react and remove the exposed copper and won't react with the masked copper under the Black tape. Now take out the PCB from the solution without touching the solution and remove the Black tapes.

**CIRCUIT DIAGRAM:**



## CONCLUSION:

The automatic rain sensing wiper system demonstrates an effective application of electronic components and circuitry to achieve automated functionality in a wiper system. By utilizing the principles of astable multivibrator operation, comparator functionality, and motor driver control, the system is able to accurately detect rain conditions and activate the wipers accordingly.