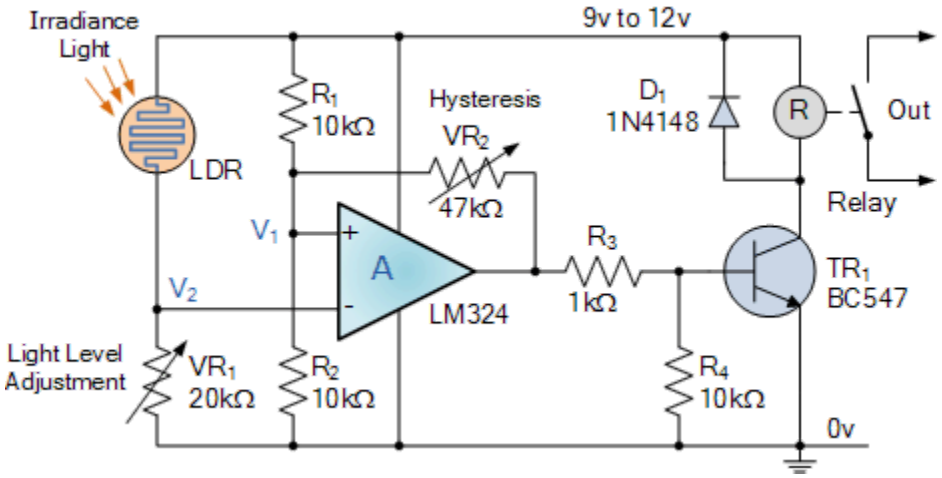
I. The Circuit



II. The Components and Its Functions

- **BATTERY** - This component provides power to electronic circuits, making them functional and portable.
- **TORCH LDR** - They are commonly used in a variety of applications, including outdoor illumination, security lighting, and emergency lighting, when autonomous operation is sought depending on ambient light conditions.
- **VARIABLE RESISTOR POTENTIOMETER (VR1 & VR2)** - Voltage division, signal conditioning, calibration, biasing, and user interface control are some of the functions of this component.
- **RESISTORS (R1 - R4)** - The capacity of this component to manage current and voltage is critical to the operation and functionality of electronic devices.
- **LM324** - The versatility of this component, as well as its ability to incorporate many op-amps into a single package, making it a popular choice for a wide range of electrical applications and systems.
- **BC547 (Q1)** - The capacity of this component to amplify signals, switch currents, reverse signals, and perform different signal processing activities makes it a critical building element in many electronic devices and systems.
- **1N4148 (D1)** - The capacity of this diode to carry current in one direction while blocking it in the other makes it a flexible component in electronic circuits, allowing it to perform a range of activities relating to signal processing, protection, and voltage control.
- **RELAY (RL1)** - The versatility of this component to offer isolation, amplify signals, and tolerate large loads makes it important in a broad range of applications, from simple home automation to complicated industrial control systems.
- **GROUND (GND or 0V)** - functions as a reference point, a steady voltage supply, a current return path, and a safety precaution.
- **LED** - serve various essential functions in electronic circuits and devices due to their ability to convert electrical energy into visible light efficiently.

III. YT Link:
https://www.youtube.com/watch?v=oet3qw-HRQ8

IV. Analysis.

A specialized electronic device called “Light Activated Differential Amplifier” is transforming light signals into electrical signals and differentially amplifies them. The differential amplifier amplifies the difference between the two inputs (Non-inverting input VIN(+) and inverting input VIN(-)) , it can easily attenuate common-mode noise in which the same noise is applied to the differential input terminals. As you can see, the diagram serves as a light-activated switch that toggles the output relay between "ON" and "OFF" depending on whether the light level measured by the LDR resistor is more than or less than a predetermined threshold. The R1 - R2 voltage divider network applies a specific voltage to the non-inverting input terminal of the op-amp LM342. With a feedback potentiometer VR2, the V1 voltage controls the op-amp trip point and switches the hysteresis, or the difference in light brightness between ON and OFF. The second leg is made up of a light-dependent resistor, the value of which is depending on the amount of incident light. It is possible to create a precision light-sensitive switch by changing the potentiometers VR1 and VR2. The output of the op-amp can switch the load directly, or it can employ a transistor switch to control a relay or the lamps themselves, depending on the application.

V. Conclusion.

The LDR varies depending on the amount of the incident light. If we base it on the diagram/circuit, it shows that R1 and R2 have the same value of resistance that causes the voltage in the non-inverting terminal of the op-amp to go low; depending if the voltage of the power source is 9V or 12V. If the LDR is not lighting up, it is because the resistance is high which causes the voltage to become lower. Meaning, the op-amp’s output will become high and cannot be conducted by the transistor further the relay will not receive voltage and it will stay in an OFF state. When we turn on the LDR going to its maximum state, the of the LDR and the voltage in the interval of the terminals will become lower, then the voltage in the inverting terminal V2 will go higher. Moreover, the op-amp output will go down so the transistor can conduct and the relay will also receive the voltage that will cause it to light up; ON state.

As we can see in potentiometers which are VR1 and VR2, VR1 will act as the light level adjustment, if it is in the minimum, the LED will light up but if it is in the maximum, the LED will just be off for the reason that , it is connected in the interval of the terminal of LDR and inverting terminal V2. While, VR2 is the feedback of the potentiometer in the interval of one of the inputs going to the output, it serves as the gateway for switching depending on its inputs, if it's going higher or lower. When the VR2 is at minimum, the LED will light up and vice versa. VR2 is what gives the LED light so it can be adjusted whether it lights up or not.