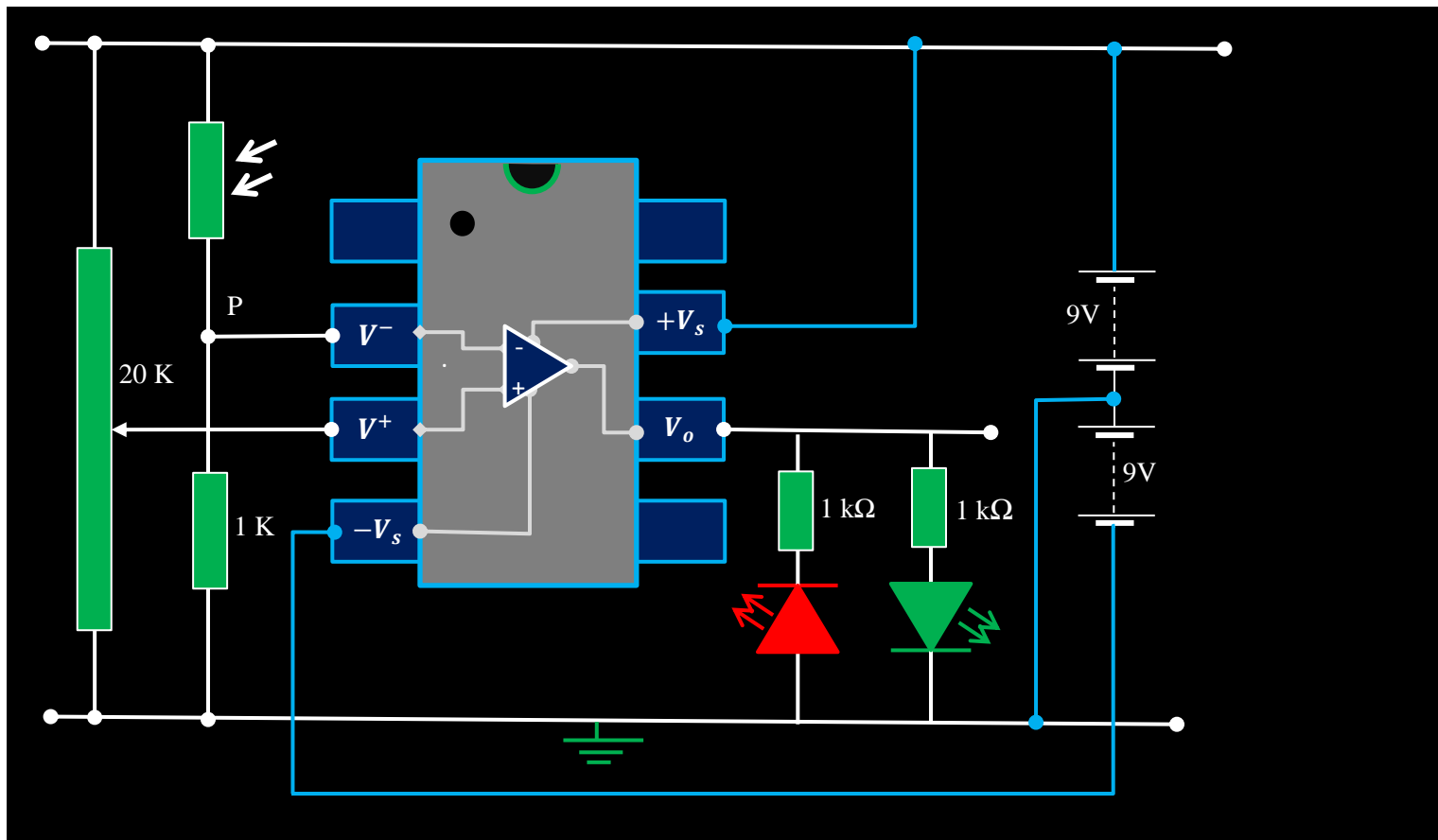


THE OPERATIONAL AMPLIFIER

Light Sensor

The op-amp is configured to sense light intensity



The resistance of the LDR decreases with increase in light intensity. That is, it has highest resistance in darkness and least resistance in daylight. The potential difference across the LDR therefore increases with decrease in light intensity. This means that the potential difference across the 1K resistor decreases with decrease in light intensity. The potential difference across the 1K resistor is equal to the inverting input since it is equal to the potential at point P. Since the potential difference across the 1K resistor is equal to the inverting input, then it can be regarded as the input resistor.

The potentiometer on the other hand can be varied in order to fix the value of the non-inverting input. In order for the LED's to switch over at the slightest change in light intensity, the difference between the two inputs must be very small. To set this value, one can connect a voltmeter between the two inputs and then vary the potentiometer while keeping an eye on the voltmeter.

NB: The setting must be done at different light intensities and according to what one desires.

APPLICATION

Variation of light intensity which is falling on the LDR can be achieved by either covering the LDR thus obscuring the LDR or allowing the light intensity from the source to change naturally such as the one due to

the movement of the sun. In the former case, this device could find numerous application in industry and in security while the later can be used to automate mechanical devices which control street lights.

Numerous output devices can now be used. These will be controlled by light intensity falling on the LDR.

Carry out your own investigations to answer the following QUESTIONS

- With the difference between the two inputs being very small (close to zero) and positive, explain what happens to the LED's when you obscure the light falling on the LDR.
- With the difference between the two inputs being very small (close to zero) and positive, explain what happens to the LED's when you INCREASE the intensity of light falling on the LDR
- Now make the difference between the two inputs to be too large and repeat the procedures above. Explain each of your observations.
- Suppose you do not have a voltmeter, how would you use the LED's to make the difference between the two inputs very small?

PROJECT (SUGGESTIONS)

Use your knowledge from the investigations above to make a simple

- Burglar alarm
- Counter
- Automatic bottle filling machine
- Hand gesture detector (play a trick on someone)