

1 LAB SESSION 1

To measure the intensity of light using Phototransistor as a light sensor and study the characteristics

1.1 Learning Objective:

At the end of this study, the student will be able to:

- To use different parts of Transducers and Instrumentation Trainer including photo transistor, power amplifier and potentiometer.

1.2 Apparatus

In order to complete the demonstration, we need a number of pieces of equipment.

- Phototransistor
- Lamp Filament
- Power Amplifier
- Voltmeter
- Potentiometer

1.3 Main Parts of Transducers and Instrumentation Trainer

1. Power Supply Section
2. Sensors Panel
3. Transducer Panel
4. Potential Dividers
5. Switching Section
6. Sound Section
7. Position Sensors Section
8. Pressure test Section
9. Light Sensitive Section
10. Temperature Test Section
11. Tachometer Test Section
12. Display Section

1.4 Related theory

A phototransistor is a device that converts light energy into electric energy.

Phototransistors are similar to photoresistors but produce both current and voltage, while photoresistors only produce current. This is because a phototransistor is made of a bipolar semiconductor and focuses the energy that is passed through it. Photons (light particles)

activate phototransistors and are used in virtually all electronic devices that depend on light in some way.

The common emitter phototransistor circuit configuration is possibly the most widely used, like its more conventional straight transistor circuit. The collector is taken to the supply voltage via a collector load resistor, and the output is taken from the collector connection on the phototransistor. The circuit generates an output that moves from a high voltage state to a low voltage state when light is detected.

The circuit actually acts as an amplifier. The current generated by the light affects the base region. This is amplified by the current gain of the transistor in the normal way.

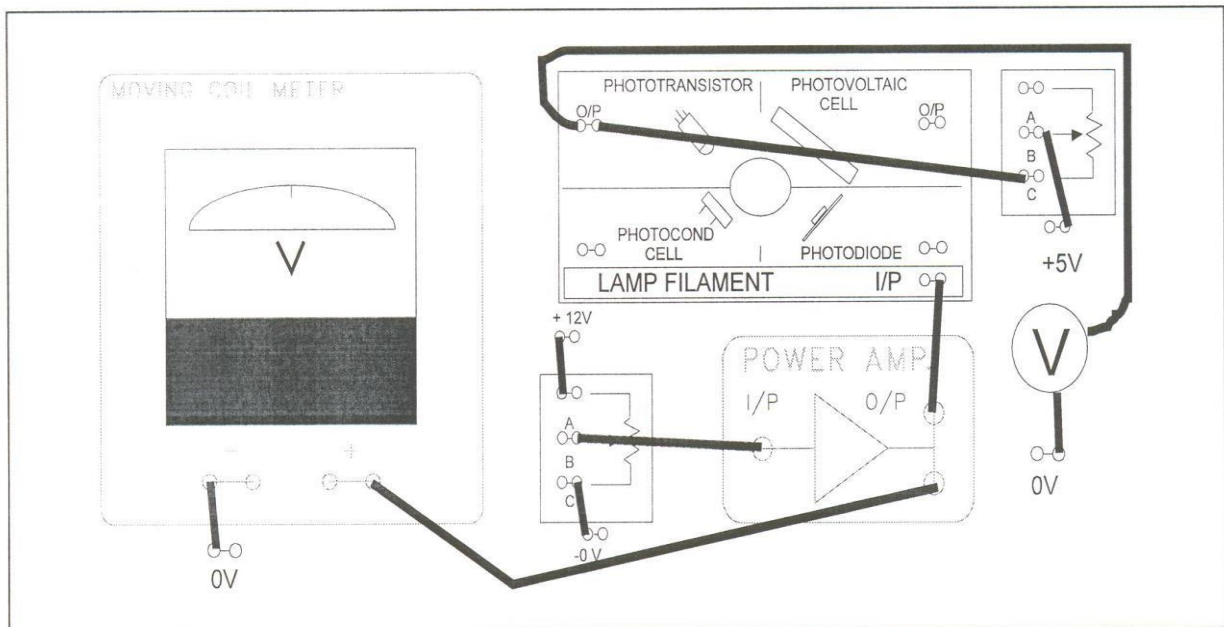


Figure 1-1 Photo Transistor Circuit

Water is drawn from the sump tank by a centrifugal pump and a panel mounted control valve regulates the flow. An easy-to-use quick release pipe connector situated in the bench top allows for the rapid exchange of accessories without the need for hand tools.

Each accessory is supplied as a complete piece of equipment needing no additional service items other than the Hydraulics Bench. When coupled to the bench they are immediately ready for use.

1.5 Experimental procedure:

- 1) Set up the equipment and identify its components.
- 2) Connect the circuit as shown in figure and adjust the sliding carbon potentiometer of $10\text{K}\Omega$ in position 2 so that the resistance with the load of the phototransistor will be approximately $2\text{K}\Omega$.
- 3) Connect the power supply (ON), adjust the wire wound potentiometer of $10\text{K}\Omega$ for that the voltage will be null at the output of the power amplifier.
- 4) Note the output voltage of the collector of the phototransistor:
 - (a) With your hand covering the transparent casing (0a).
 - (b) With the phototransistor exposed to ambient light (0b).
- 5) Now increase the output voltage of the power amplifier through intervals of 1V and observe the voltage in the collector of the phototransistor.
- 6) Insert the values in table 1.1

1.6 Observations & Calculations

Table 1.1: Calculation of Light Intensity and Photo Voltaic Output

Obs. n	Intensity of Light (V)	Output of Photo Transistor (V)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

1.7 Graph

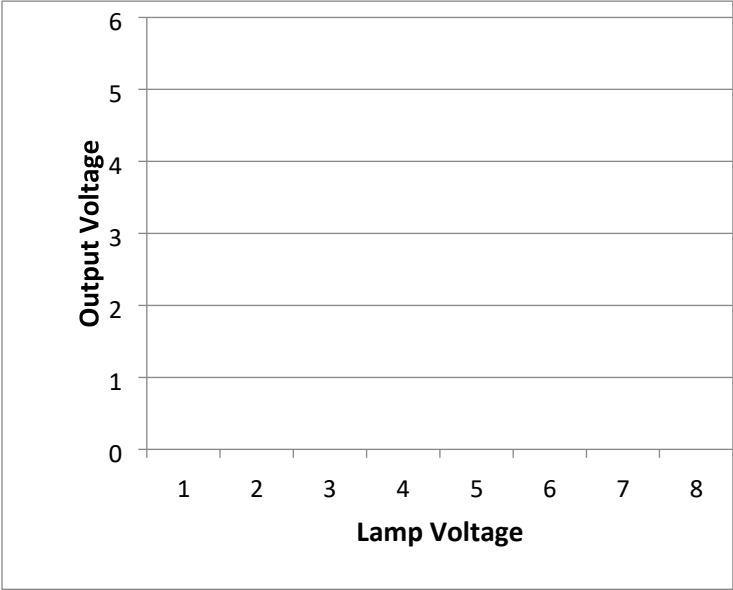


Figure 1-2 Characteristics of Photo Transistor

1.8 Conclusion: