

Experiment:4

Describe the Construction and Characteristics of Temperature Transducer.

EQUIPMENTS

- Temperature Transducer Trainer IT-5929.
- 2mm Connecting Leads.
- Digital Millimeter.
- Stopwatch (not supplied).

THEORY

Temperature Sensor IC:

This is an integrated circuit containing 16 transistors, 9 resistors and 2 capacitors contained in a transistor type package. The device reference number is LM 35 and it provides an output of 10 mV/°C. Measurement of the output voltage therefore indicates the temperature directly in°C. For example, at a temperature of 20°C, the output voltage will be 200mV.

The circuit arrangement provided with the IT-5929 unit is shown in Figure 4.1.

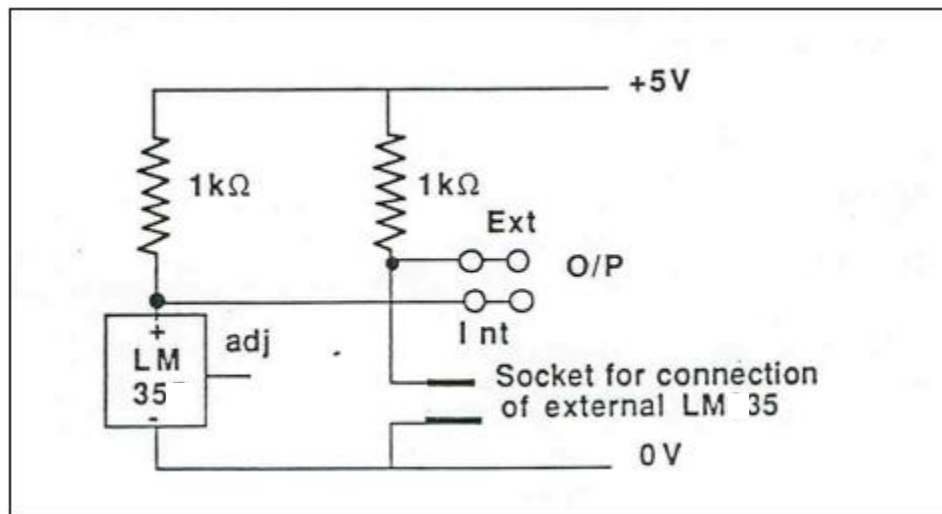


Figure 4.1 (Circuit Arrangement IT-5929)

The output from this external LM-35 can be used as an indication of the ambient temperature outside the heated enclosure and that from the “Int” socket in Figure 4.1 indicates the temperature within the heated enclosure.

LM-35(Temperature Sensor):

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

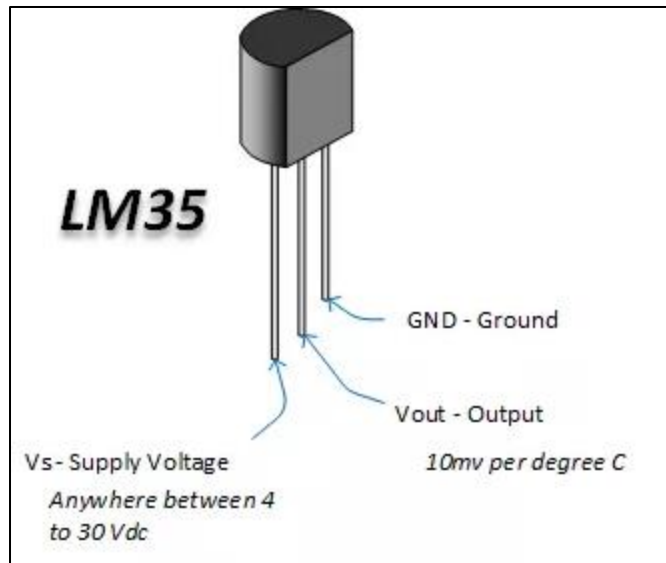


Figure 4.2 (LM35)

Features:

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee-able (at +25°C)
- Rated for full -55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts

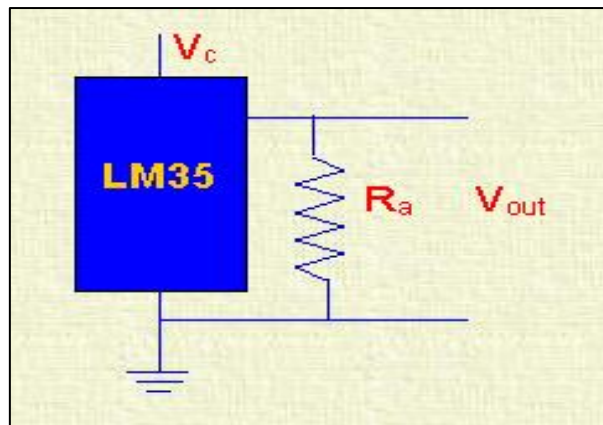


Figure 4.3

Why Use LM35to Measure Temperature?

- You can measure temperature more accurately than a using a thermistor.
- The sensor circuitry is sealed and not subject to oxidation, etc.
- The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

EXPERIMENT

This exercise illustrates the characteristics of the LM 35 transducer, indicates the maximum temperature rise possible using the heater supplied at 12 V and indicates the time scale required for the unit to reach stable conditions.

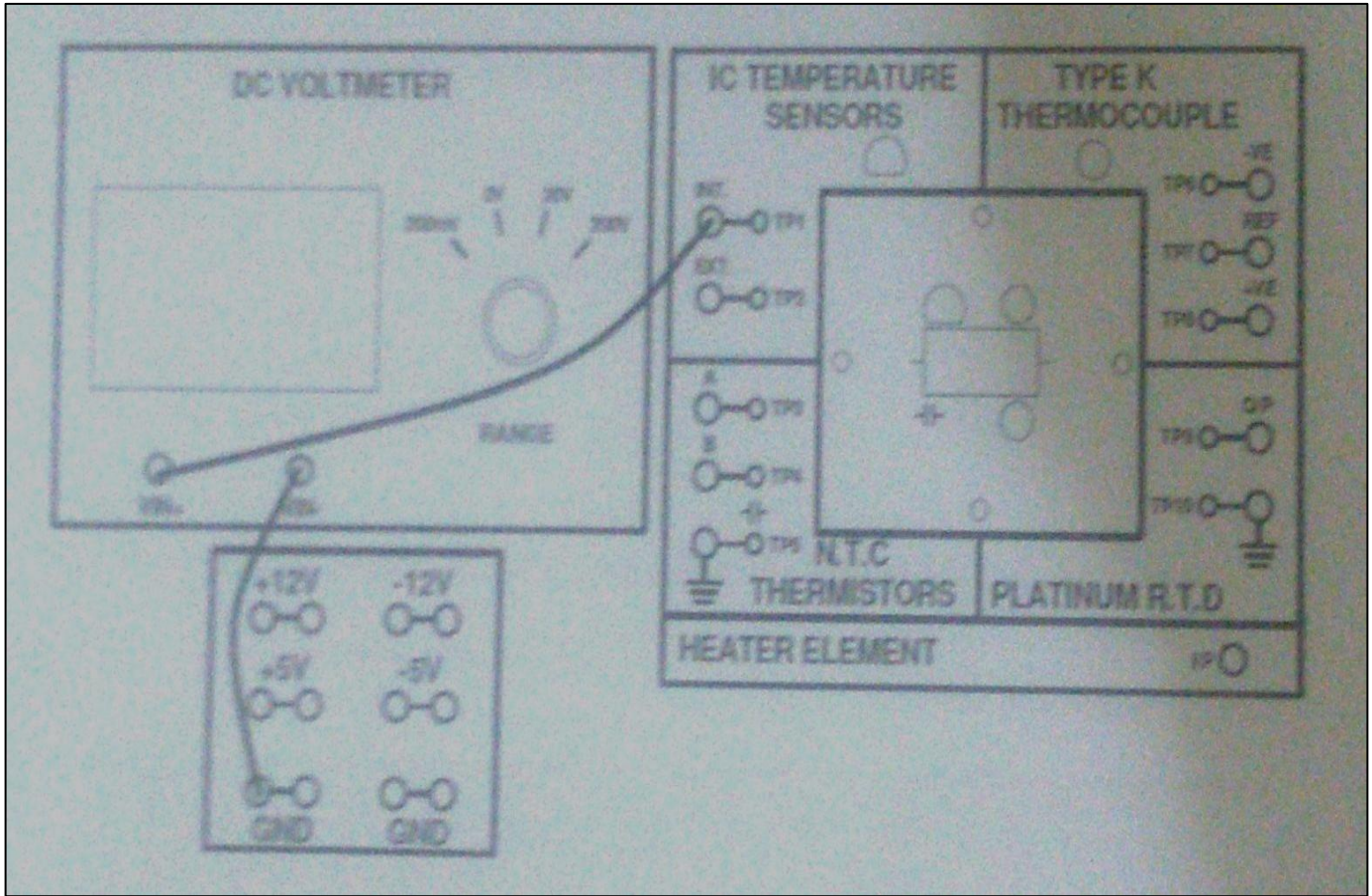


Figure 4.4 (Experimental Setup)

Procedure:

- Connect the voltmeter to the circuit as shown in Figure 4.4, switch the power supply ON and note the output voltage, this represents the ambient temperature in °C. Record this value.
- You can set the voltmeter at 2V or 200mV according to your need.
- Now connect the +12 V supply to the heater input socket and note the voltage reading every minute until the value stabilizes.
- Enter the values in Table 4.1.
- It provides an output of 10 mV/°C. Measurement of the output voltage therefore indicates the temperature directly in °C. For example,
- At the output voltage of 200mV, temperature will be 20°C.
- Divide the output received by 10 and you will get the desired temperature in °C.

RESULTS:

Observation Table:

Time (Minutes)	Voltage (Volts)	Temperature (°C.)
0		
1		
2		
3		
4		
5		
6		
7		

Table 4.1 (Observations LM35)

DISCUSSION

State the output voltages you would expect to obtain from an LM 35 temperature transducer at the following temperatures:

1. 0°C.
2. 50°C.
3. -20°C.

