Objective: To study and calibrate temp using resistance temperature detector (RTD)

Apparatus Used:

Name of the apparatus	Range/Rating	Quantity
1. Transducer (RTD)	PT-100	1
2. Signal Conditioner		1

Excitation Source : Constant current Type

First Stage Amplifier : DC Differential

Second Stage Amplifier: Summing Amplifier with zero and Gain adjustment

Power Source: ± 5 Volt DC

3. Digital Panel Meter $3\frac{1}{2}$ Digit LED Display, 2000 mV FSR 1

4. Variable Resistance Source: 99 to 150 ohm adjustable. 1

Theory

This chapter explains the working principle of RTD and associated instrumentation in brief.

A. RTD: The resistivity of metals increases with an increase in temperature (i.e. temp coefficient is positive), where as in some semiconductors the resistance decreases with increase in temperature (i.e. temp coefficient is negative)
The resistance thermometer based on the above phenomenon is one of the most accurately reproducible temp- sensing device. PT-100 is unduly used as RTD.

B. Signal Conditioner Module:
AC constant current signal is applied on the RTD to make it operative. The output of the RTD is directly fed to the input of DC differential amplifier and then is fed to a summing amplifier with a gain and zero adjustment to obtain the output directly unit temperature.

The final output of the amplifier is fed to Digital Panel Meter to display the temperature. Gain adjustment pot is given for the adjustment of amplifier gain and zero pot is given for the zero adjustment.

C. Variable Resistance Source:

A 99 to 150 ohm variable wire wound pot is provided with the set-up to calibrate the signal conditioners module for measurement of temp directly in ^{0}C.

A table for Resistance versus temp for PT 100 is given below:

S No.	Temp (^{0}C)	Resistance (ohm)
1	00	100.00
2	10	103.90
3	20	107.79
4	30	111.67
5	40	115.54
6	50	119.40
7	60	123.24
8	70	127.24
9	80	130.89
10	90	134.70
11	100	138.50

Circuit Diagram-

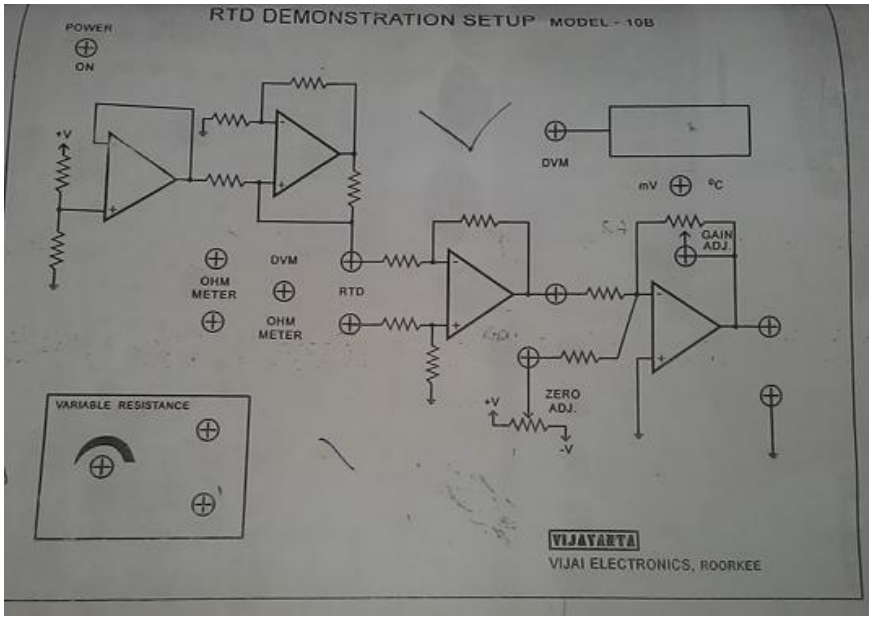

Fig 1. Circuit diagram of RTD Demonstration Setup.

PROCEDURE:

a) Place a beaker containing water.
b) Place an immersion rod in the beaker.
c) Keep the RTD probe in the beaker.
d) Connect the 3 pin mains plug of the demonstration Set-up to the mains socket.
e) Connect the output of signal conditioner with the digital panel meter.
f) Set output of variable resistance at 100 ohm with a Multmeter/ohmmeter.
g) Connect variable resistance output to the I/P of signal conditioner(Marked as RTD)
h) Adjust gain pot so that display will show 0^0C.
i) Remove output of variable resistance from I/P.
j) Set variable resistance at 138.50 ohm with a Multimeter/Ohmmeter.
k) Connect variable resistance output to I/P.
l) Adjust gain pot so that display will show 100^0C.
m) Repeat step (f) to (l) two or three times for perfect calibration.

n) Remove variable resistance lead from the I/P and connect RTD probe.
o) Heat the RTD kept in water and note down the reading shown by the display after a fixed time interval.
p) Display will show the temperature in ^{0}C unit.
q) Plot the graph between temp (in ^{0}C) and resistance.

Observation Table:

PT-100			
S. NO.	**Time (Sec)**	**Temp by RTD**	**Resistance**

RESULT: It is observed that the plot between temp and resistance is a straight line.

Precaution:

i. While measuring the temp the maximum temp should not exceed the temp rating specified.

ii. Do not put your finger in the hot water.