Experiment: 11

Discuss the Characteristics of NTC Thermistor Bridge Circuits.

EQUIPMENTS

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

THEORY

Two thermistor bridge circuits:

When used for alarm or protection circuits, two thermistors would normally be used, these being connected in a bridge circuit as shown in Fig 11.1

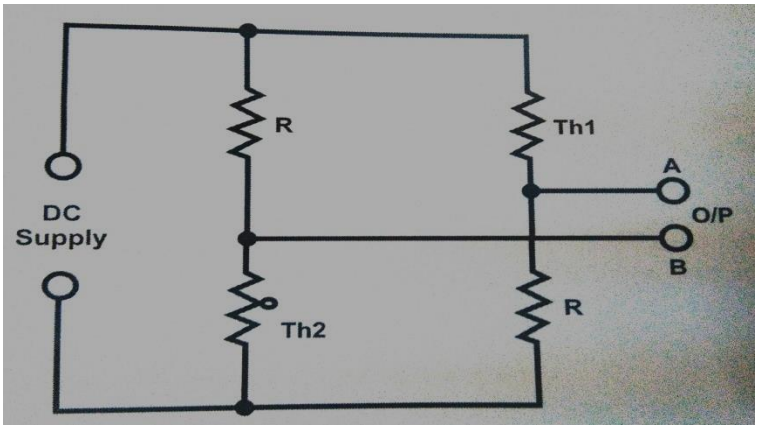


Figure 11.1 (Circuit Diagram)

The two resistor R have same resistance as the "cold" resistance of the thermistors. When cold, there will be no output at the connections AB because the bridge will be balanced under this condition. As the temperature rises, the resistance of both thermistors will decrease. The potential of connection A will rise and that of connection B will fall, giving a larger output than would be obtained with a circuit using only one thermistor.

Note that the output with two active thermistors is greater than that with only one thermistor. However, if both active thermistors were at the same temperature, the output voltage would be twice that for one active thermistor.

PROCEDURE:

Background

Two bridge circuits will be investigated, one containing only one thermistor (Th1) and the other, two.

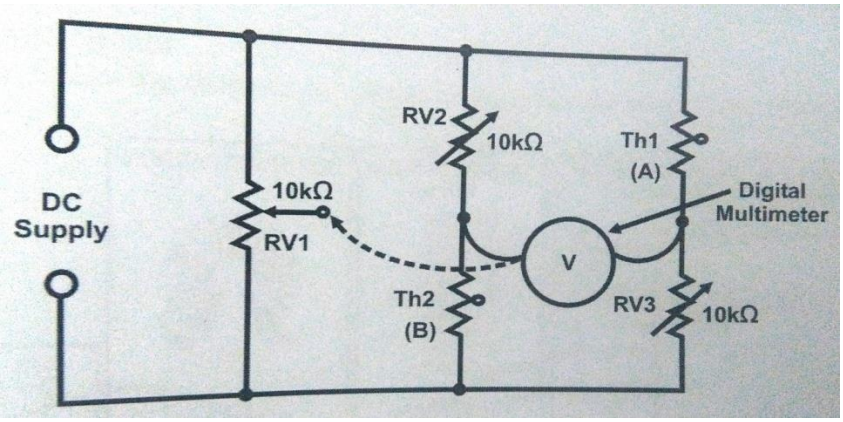


Figure 11.2 (Trainer Internal Setup)

Since the three branches of to be used are all in parallel, they can be connected at the beginning and brought into operation simply by moving the null detector (digital multimeter). Note that the second thermistor (Th2) is not contained within the heated enclosure and will therefore not be subjected to the same heating effect as Th1. The circuit will not be as efficient as can be expected from one in which both thermistors are mounted in the same temperature environment.

Variable resisters, RV2 & RV3 are adjusted to balance the branch "cold" resistances (approximately 5kΩ) to give 2.5V at the center-tap, and RV1 is also adjusted for 2.5V at the wiper. The circuit will then be ready for heating measurements. Th1, the 10kΩ 10-turn resistor and the 10kΩ wire wound resistor from the bridge circuit with one active thermistor. Th1, the 10kΩ 10-turn resistor, Th2 and the 10kΩ carbon resistor from the bridge with two active thermistors.

EXPERIMENTAL SETUP:

Refer to fig 11.3 configure setup for the present experiment.

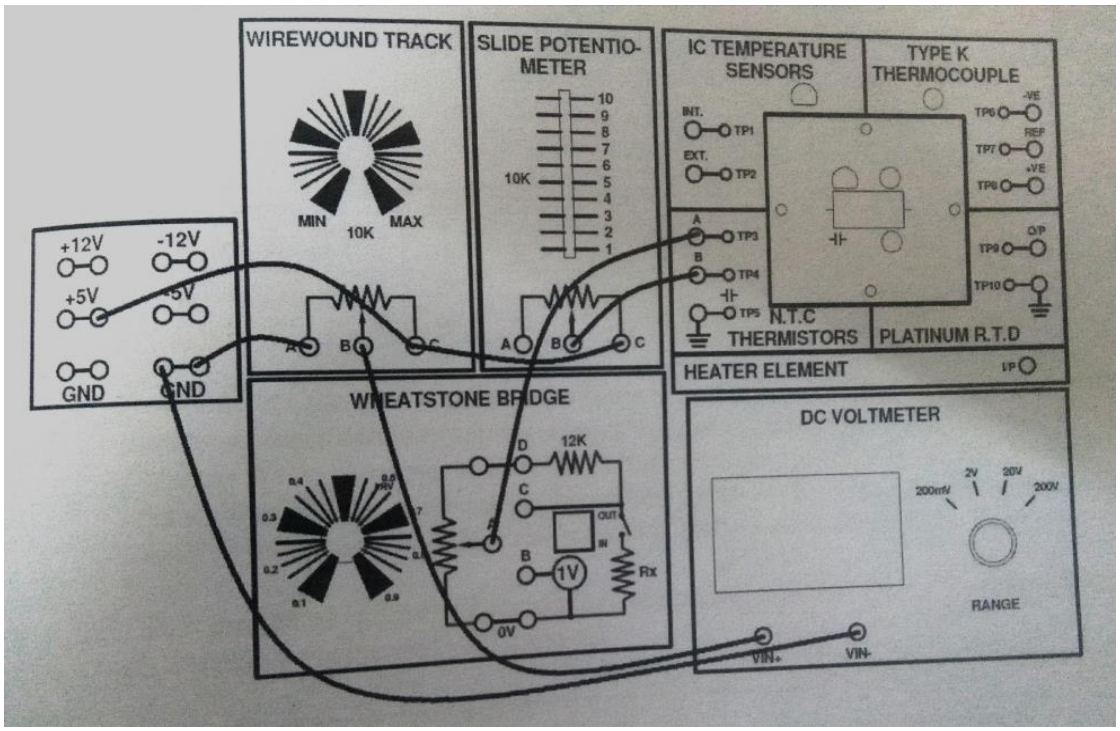


Figure 11.3 (Experimental Setup)

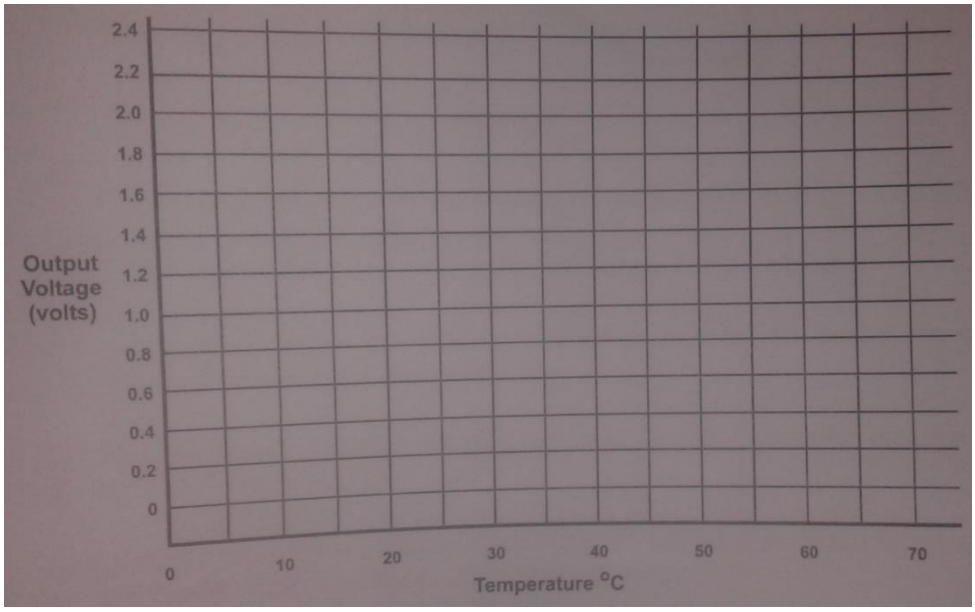
PROCEDURE:

- Connect the circuit as shown in fig 11.3 and set the switch on the Wheatstone bridge circuit to OUT.
- Switch the power supply ON and adjust so that the voltmeter reading is 2.5V. The fixed branch of the bridge is now set for center balance.
- Connect the voltmeter between socket B of the 10k wire wound resistor and socket B of the n.t.c. Adjust the 10k carbon slider resister for an output voltage of zero.
- Both bridges are now set for zero output with the thermistors at ambient temperature.
- Note the temperature by measuring the voltage output from INT. Socket of the IC temperature sensor record the value in Table 11.1.

Time	(minutes)	0	1	2	3	4	5	6
Temperature (IC temperature transducer)	(°C)							
Bridge Output	1 active n.t.c	V	V	V	V	V	V	V
	2 active n.t.c	V	V	V	V	V	V	V

Table 11.1 (Observations N.T.C Thermistor Bridge Circuit)

- Now connect the 12V supply to the heater input and at 1-minute intervals, note the temperature and output voltage from each bridge circuit. Measured the 1 active n.t.c. between socket A of the n.t.c and socket B of the 10k wire wound resistor and move the voltmeter from the 10k wire wound to socket B of the 10k slide resistor for the 2 active n.t.c. Record the values in Table 11.1.
- Draw graph 11.1 of output voltage against temperature for two bridge circuits on the same axes provided (graph).



Graph 11.1 (Output Voltages Vs Temperature)

CONCLUSION

Instructor Signature: _____ **Date: _____**