OPERATING INSTRUCTIONS FOR ANDERSON'S BRIDGE

OBJECT:

To measure self inductance of a coil using Anderson's Bridge.

APPARATUS:

Anderson's Bridge has been designed on a training board New Tech Type NTI – 117. It consists three fixed resistances R_1, R_2, R_3. R_1 is connected in between A and B. R_2 is connected in between B and C. Thus R_1 and R_2 form two ratio arms, R_3 is connected in between A and D and a variable resistance R_4 is connected in unknown arm C and D. The inductance (L) to be measured is also connected in the same arm. Thus R_4 and L are in series. A set of seven capacitors C = C_1, C_2, C_3, C_4, C_5, C_6, C_7 and resistance r in two steps of (i) X 100Ω upto 1KΩ (ii) X 1KΩ upto 10 KΩ are provided on the board. Fixed frequency oscillator is connected in the bridge two terminal provided for this. A headphone or galvanometer fitted with diode is joined in between two terminals marked for this purpose. Three inductances L_1, L_2 and L_3 are also provided on the board. L_1 is between first and second terminal, L_2 is between second and third terminal, L_3 is in between third and fourth terminal.

THEORY:

When Anderson Bridge is balanced in the sound in head phone or deflection in galvanometer fitted with diode is minimum. The potential at E & F is same then:

$$\because \quad \frac{P}{Q} = \frac{R}{S}$$

$$\therefore \frac{R_1}{R_2} = \frac{R_3}{R_4}$$

And if P = Q or $R_1 = R_2$

$$\boxed{L = CR_3 (R_2 + 2r)} \quad \text{..... (1)}$$

PROCEDURE:

(1) Connect one self inductance say L2 (second and third terminals) to the sockets provided across the symbol of the Coil in the bridge circuit.

(2) Connect a leclanche cell or lead accumulator in place of oscillator and Galvanometer at place of head phone. Adjust R4 so that Zero deflection is obtained in Galvanometer keeping r at 0 resistance.

(3) Now disconnect leclanche cell and at its place connect fixed frequency oscillator. Head phone or Galvanometer fitted with diode is connected at its proper place.

(4) Set suitable value of C and by changing r obtain minimum sound in head phone or minimum deflection in Galvanometer. Record the value of C and r in O.T.

(5) Changing value of C repeat step (4) a number of times. Record the value of C and r in O.T.

(6) Calculate L using formula (1) given in theory.

OBSERVATIONS : Given Values :

$R_1 = R_2 = R_3 = 1K\Omega$

$C_1 =$ …… μF, $C_2 =$ ….. μF, $C_3 =$ …… μF

$C_4 =$ …… μF, $C_5 =$ ….. μF, $C_6 =$ …… μF and $C_7 =$ ……. μF

$L_1 =$ …… mH, $L_2 =$ ….. mH, $L_3 =$ ….. mH

S. No.	Value of C μF	Resistance r Ohms	Inductance L mH
1			
2			
3			

Mean Value of L = ……. mH

CALCULATIONS:

$L = CR_3 (R_2 + 2r)$ Henry

$= CR_3 (R_2 + 2r) \times 10^3$ mH

RESULT:

Inductance of the given:

Coil = …. mH

Standard value = …. mH

PRECAUTIONS:

(1) Initially the output of frequency oscillator should be kept low and near null point it should be increased.

(2) If head phone is used these should be silence in the neighbouring.

(3) For greater sensitivity of the bridge resistances in the four arms should be nearly same.

(4) Plug type Resistance box or P.O. box should not be used.

(5) For obtaining balance point $L > CR_2R_3$.

(6) For inductance L_1 is of low value C_1, C_2, C_3 capacitors should be used. For inductance L_2 is medium value C_3, C_4, C_5. Capacitors should be used and for L_3 Capacitors C_5, C_6, C_7 should be used to get null point and better results.

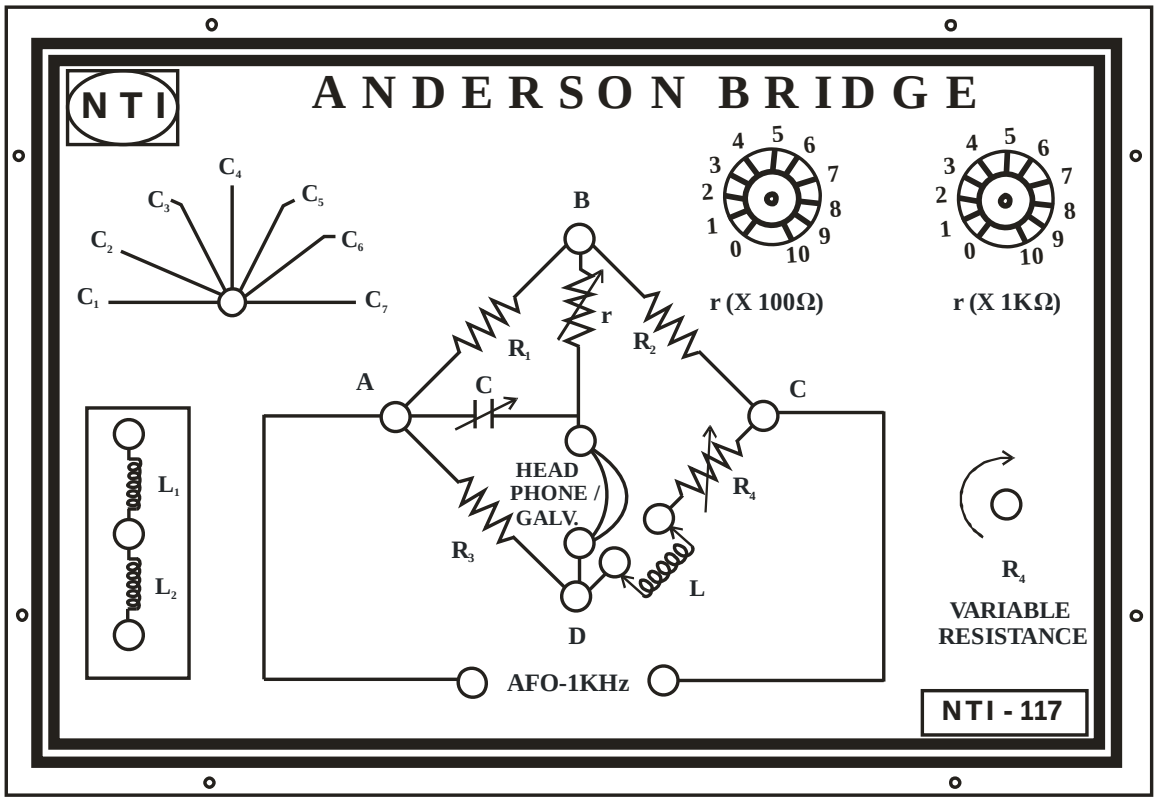

Fig. (1) Panel Diagram

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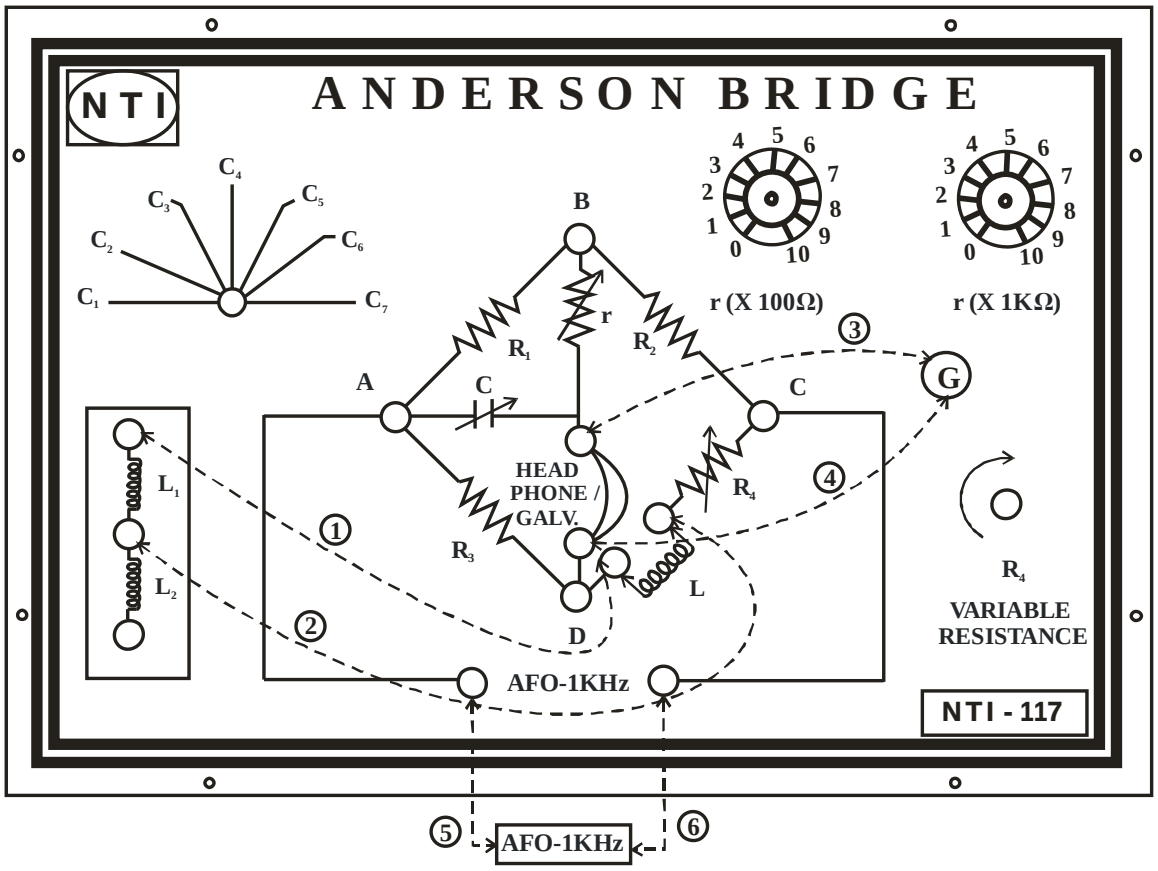

Fig. (2) Connections for ANDERSON BRIDGE

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