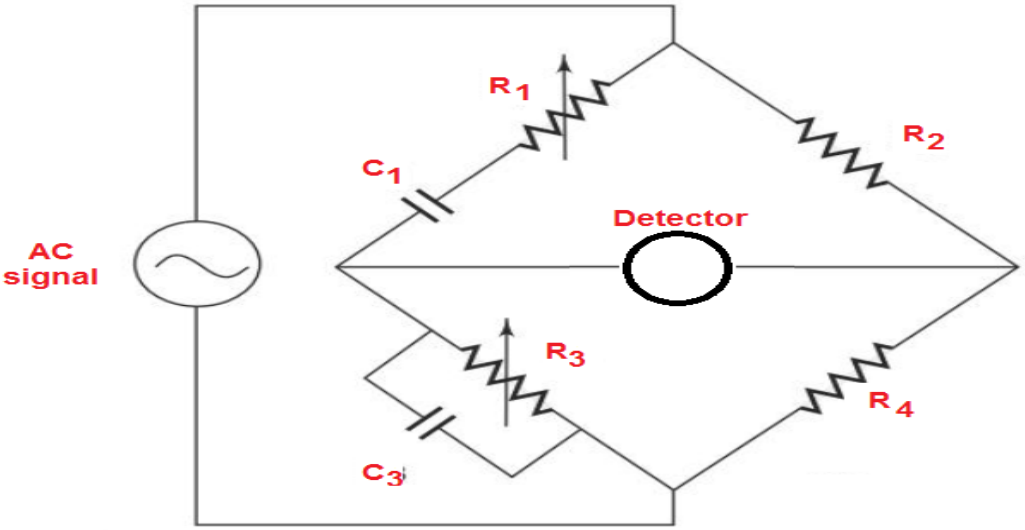
WEIN BRIDGE

The Wien bridge has a series *RC combination in one* arm and a parallel adjoining arm. Wien's bridge is designed to measure frequency. It can al measurement of an unknown capacitor with great accuracy. The audio range into 20 - 20 kHz ranges.

Used to measure the capacitance to a high degree of accuracy when frequ standards.



$$C_3 = \left(\frac{R_2}{R_4}\right.$$

The impedance of one arm is

$$Z_1 = R_1 - j/\omega C_1.$$

The admittance of the parallel arm is

$$Y_3 = 1/R_3 + j\,\omega\,C_3.$$

Using the bridge balance equation,

we have $Z_1\,Z_4 = Z_2\,Z_3.$

Therefore, $Z_1\,Z_4 = Z_2/Y_3$, i.e. $Z_2 = Z_1\,Z_4\,Y_3.$

$$R_2 = R_4\left(R_1 - \frac{j}{\omega\,C_1}\right)\left(\frac{1}{R_3} + j\omega C_3\right) \qquad (1)$$

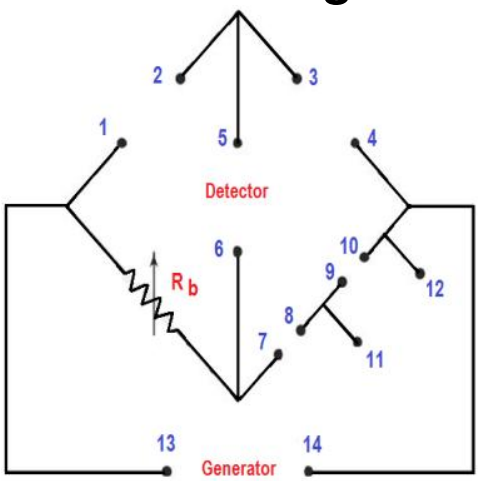
$$R_2 = \frac{R_1\,R_4}{R_3} - \frac{j\,R_4}{\omega\,C_1\,R_3} + j\,\omega\,C_3\,R_1\,R_4 + \frac{C_3\,R_4}{C_1}$$

$$R_2 = \left(\frac{R_1\,R_4}{R_3} + \frac{C_3\,R_4}{C_1}\right) - j\left(\frac{R_4}{\omega\,C_1\,R_3} - \omega\,C_3\,R_1\,R_4\right)$$

Equating the real and imaginary terms we have

$$R_2 = \frac{R_1\,R_4}{R_3} + \frac{C_3\,R_4}{C_1} \quad \text{and} \quad \frac{R_4}{\omega\,C_1\,R_3} - \omega\,C_3\,R_1\,R_4 = 0$$

LCR Bridge

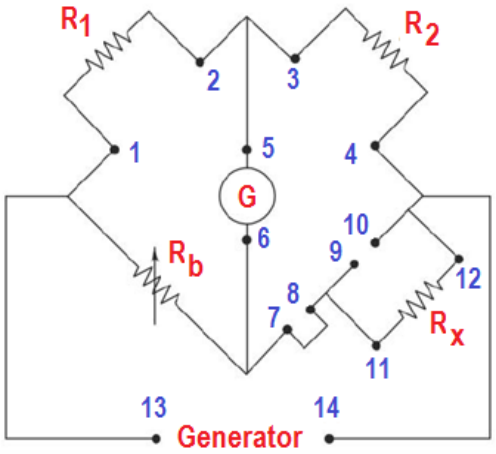


Skeleton type Bridge

- A simple bridge for the measurement of resistance, capacitance and in with four resistance decades in one arm, and binding post terminals capacitors may be connected, to complete the other arms.
- For the LCR Bridge, Rb is self contained.
- The other arms are completed by connecting the unknown and standa 2, 3-4, 7-8, 9-10, and 11-12, a null detector to 5-6, and a generator to 1
- This bridge can be used for both ac and dc measurements.
- By proper arrangement of the bridge arms:

➢ Wheatstone's bridge may is set up for resistance measurement (ac and
➢ Comparison circuit for measurement of Capacitance (ac).
➢ Maxwell's circuit for the measurement of inductance (ac).

LCR Bridge: Wheatstone Bridge



$$R_x = \frac{R_2 R_b}{R_1}$$

LCR Bridge: Capacitance Comparison Bridge

$$C_x = \frac{C_3 R_1}{R_b}$$