WHEATSTONE BRIDGE
CATALOG #GS-470

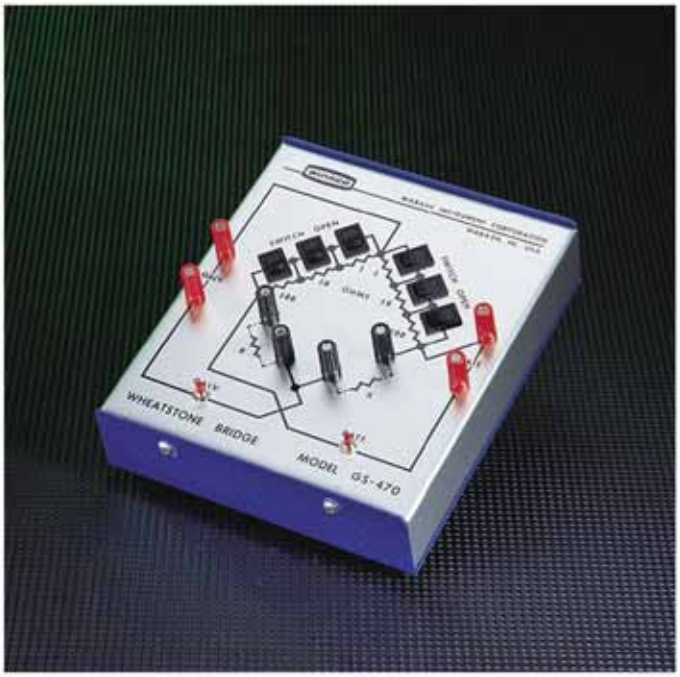
The wheatstone bridge is used for the accurate measurement of an unknown resistor. Connections should be made in accordance with drawing A-10985.

When connected as shown, there are two legs for current flow. One consists of resistors R1 and R2 in series, and the other includes R3, a resistance decade box, in series with RX, the unknown resistor.

If the voltage at the junction of R1 and R2 is identical to the voltage at the junction of R3 and RX, there will be no potential across the galvanometer and hence no current flow through it. The bridge is said to be in balance and if R1 and R2 are equal, the last term in the equation is one and the unknown resistor is equal to the value set on the decade resistance box when the bridge is in balance. Should the unknown resistor be relatively large or small compared to the range of values in the decade box, R1 and R2 can be set with the shorting switches to a ratio that will extend the range of the decade box.

Let's assume that the decade box has a maximum setting of 100 ohms, but the unknown resistor is about 8,000 ohms. From inspection of the equation we would want to set the R2/R1 ratio at 100. This multiplier will bring the decade box into the correct range. To make this setting, we would close the switches across the 100 ohm and 10 ohm resistors in the upper left resistor bank, leaving only the 1 ohm resistor in this part of the leg. Then we would close the switches across the 1 ohm and 10 ohm resistors in the upper right bank, leaving only the 100 ohm resistor. Now when the bridge is brought into balance, the unknown resistor value will be 100 times the setting on the decade box. Conversely, when the unknown resistor is of very low value, the ratio between R1 and R2 can be reversed.

And now for a few practical pointers. Always start with R1 and R2 set to high values so as to minimize the current drain on the battery. If you truly have no idea as to the value of the unknown resistor, start with the decade box set at its mid-point, and by noting the direction of current



flow through the galvanometer, see if you can bring the bridge into balance without a range change. If a range change is necessary, do it one step at a time and again try to balance the bridge.

Always close the battery switch first, then pause before closing the galvanometer switch. When applying power to the bridge, there may be an inductive kick which might damage the galvanometer. When you have finished your adjustments or readings, open the galvanometer circuit first and then the battery circuit. As before, there is apt to be a voltage spike due to inductance.

We are always pleased to hear from teachers who may have comments or suggestions about our products or their instructions. If you know of a new or better procedure and would like to share it with your colleagues, please write, or FAX us at 260-563-8400, to the attention of Manager, School Product Engineering.

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