

Re: Wheatstone bridge problem

Source: <http://sci.tech-archive.net/Archive/sci.electronics.basics/2005-06/msg00151.html>

- *From:* "Chris" <cfoley1064@xxxxxxxxxx>
 - *Date:* 5 Jun 2005 07:56:38 -0700
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Matty F wrote:

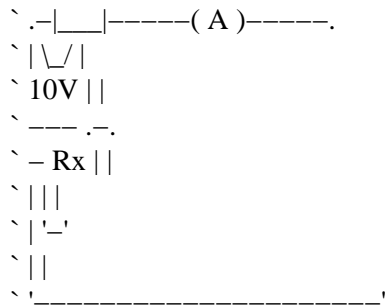
- > I've used a Wheatstone Bridge to measure the resistance of 4 large
- > solenoids. The readings were: 0.3, 0.28, 0.27, 0.26 ohms.
- > I measured all of them again and then they were all about 0.20 ohms.
- > As you can see, the readings have slowly dropped from 0.3 to 0.2 ohms.
- > Can anyone offer suggestions why the readings keep changing?
- > I assume that the battery condition is independent of the measurements.
- >
- > Each time I did a measurement I reconnected the alligator clips to the
- > terminals and wriggled them around to get a good contact, and checked
- > the reading three times for each solenoid. Each of those three readings
- > was the same. i.e. I've done a total of 24 readings.
- >
- > When I connect the two leads from the Bridge together I get a reading of
- > 0.05 ohms. There appears to be several hundred feet of 14 gauge wire on
- > each solenoid. Each time I press the check button on the bridge the
- > meter needle swings slightly to the left of its final position. Each
- > solenoid weighs about 20kg. There is no way they can be changing
- > temperature!

Hi, Matty. You haven't said specifically what instrument you're using, so I can't give specific advice. But I can say for sure that Wheatstone bridges which only have two terminals for Rx aren't made to measure low resistance. You might be getting self-heating in one of the bridge's internal resistors, or if there's an active null, battery voltage may be affecting that. These are the first causes that come to mind.

Why don't you try using a 10 volt or so regulated power supply capable of cranking an amp or so, a 10 ohm or so resistor, and a voltmeter and ammeter. Connect the resistor in series with the power supply to give you an approximately 1 amp source. Put the ammeter in series with the circuit to measure current. Then put the solenoid in the circuit, and measure voltage across the solenoid.

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`  
` 10 ohm _  
` ____/\`
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Re: Wheatstone bridge problem



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Even though this looks a little cheesy, it is in fact a true Kelvin connection, unlike your Wheatstone setup. This measurement will be as accurate as your ammeter. You don't need exactly 1 amp of current, because you can just do the math using Ohms Law to get the inferred resistance value:

$$R = V / I$$

Measure current each time you apply power -- it will change a little for every time you get a different Rx. Try to keep the application of power to the solenoid down to a few seconds or so if you can. That will reduce self heating, which is always a problem in measuring resistance of copper wire. Also look to ambient temperature, and prior heating of the solenoid coil from use. Make sure the coil is cool before you measure it.

Good luck
Chris

• *Follow-Ups:*

- ◆ [**Re: Wheatstone bridge problem**](#)

◇ From: Matty F

- ◆ [**Re: Wheatstone bridge problem**](#)

◇ From: Chris

• *References:*

- ◆ [**Wheatstone bridge problem**](#)

◇ From: Matty F

- Prev by Date: [**Re: Right Guage of Wire for the job**](#)
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