QuadTech

Application Note

Increasing the Test Voltage of a 7000 Series RLC Meter

The internal test voltage supplied by a 7000 is 5V RMS or less. This application note describes a method to increase the test voltage applied to a device under test. In cases where the 7000 instrument is not capable of supplying the desired test voltage, an external amplifier or synchronized oscillator is used to boost the test voltage to the desired level for the device under test. This is then followed by a voltage divider network to reduce the voltage to a level within the operating range of the bridge. The maximum voltage that may be applied is determined by the total amount of current flowing into the I- lead of the bridge and the range in which the bridge is set on. (Refer to setup procedure, #3) Figure 1 is representative of the technique employed where moderate accuracy is required.

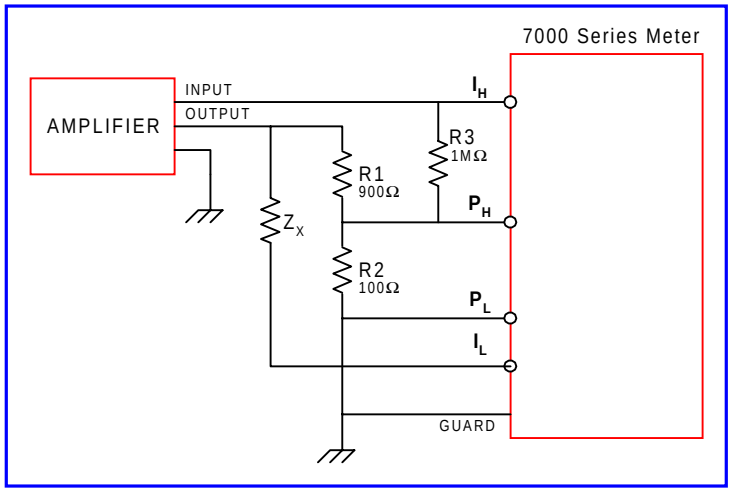

Figure 1: Moderate Accuracy Method

Setup Procedure

1. Connect the setup shown in Figure 1.

2. The accuracy of the measurement will depend on the accuracy of the divider ratio (R1/R2). The resistors should be padded to yield a 10:1 voltage ratio or a 9:1 resistance ratio. A 10:1 ratio is used to make the results easier to read, however other ratios may be used. When padding R1/R2 be sure to include the loading effect of R3 as this affects the Ph voltage.

Setup Procedure (Continued)

2. (Continued)

When operating over a wide frequency range it may also be necessary to compensate the divider for capacitive/inductive effects due to the loading effect of the bridge or of the type of resistors used in the divider. The best solution would be a transformer type divider as illustrated in Figure 2. This method would give an accurate ratio and would be almost unaffected by R3 or by loading.

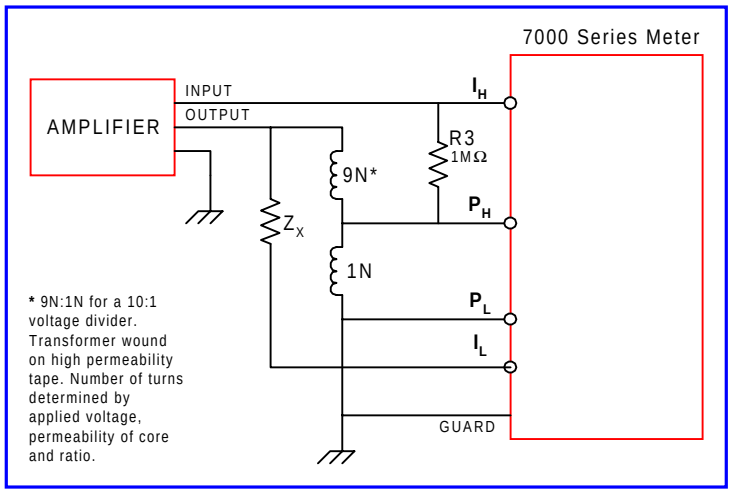

Figure 2: Transformer Divider Method

3. The maximum allowable test voltage is determined using Equation 1.

$$V = (v/r)\,(z) \quad \text{(Equation 1)}$$

Where: V = maximum test voltage
v = bridge test voltage
r = range resistance (25 ohms for low impedances)
z = unknown impedance

NOTE
To apply the maximum amount of current, select the highest internal bridge test voltage.

The maximum current that can be supplied by the amplifier should be limited such that I (in Equation 2) is not exceeded. This must be done to protect the bridge from damaging currents if the device under test fails or if an improper connection is made.

$$I = (\,v/r\,) \quad \text{(Equation 2)}$$

Measurement Procedure

1. Hold range on correct range, DO NOT ALLOW BRIDGE TO AUTORANGE.
2. Set bridge test voltage, set amplifier output to ZERO amplitude
3. Set test frequency and all other desired measurement parameters.
4. Install device under test.
5. Slowly adjust the amplifier for the desired amplitude,

WARNING
DO NOT PROCEED IF BRIDGE DISPLAY INDICATES AN OVERLOAD CONDITION.

6. Make measurement and correct reading per Table 1.

Table 1: Correction Factor

Parameter	RLC Correction	DQ Correction
R/Q	× 10 or divider ratio	None required
L/Q	× 10 or divider ratio	None required
C/D	÷ 10 or divider ratio	None required

7. Reduce amplifier output to zero and remove device under test.

Measurement Error Correction

The bridge error can be found by first measuring the device under test without the external circuitry, then comparing this to the measurement with the external circuitry in place at the same test voltage level. The bridge error once found can be used to correct the final reading.

For complete product specifications on the 7000 Series Precision LCR meters or any of QuadTech's products, visit us at http://www.quadtech.com/products. Do you have an application specific testing need? Call us at 1-800-253-1230 or email applications at jkramer@quadtech.com and we'll work with you on a custom solution. Put QuadTech to the test because we're committed to solving your testing requirements.

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