QuadTech

Application Note

Guidelines for Using External Bias Function of the 7400 and 7600

Figure 1 illustrates an external bias circuit compatible with the 7000 Series Precision LCR Meters. The customer supplied external power supply Vext is placed in series with the internal AC source. Under some circumstances, discussed below, it is also advisable to add a bypass capacitor to the external bias terminals. If the component under test has a high DC impedance value this results in a DC voltage of the same sign and magnitude as that applied at the external bias terminals. For accurate measurements, observe the following precautions when applying an external bias circuit to the 7000 Series Instrument.

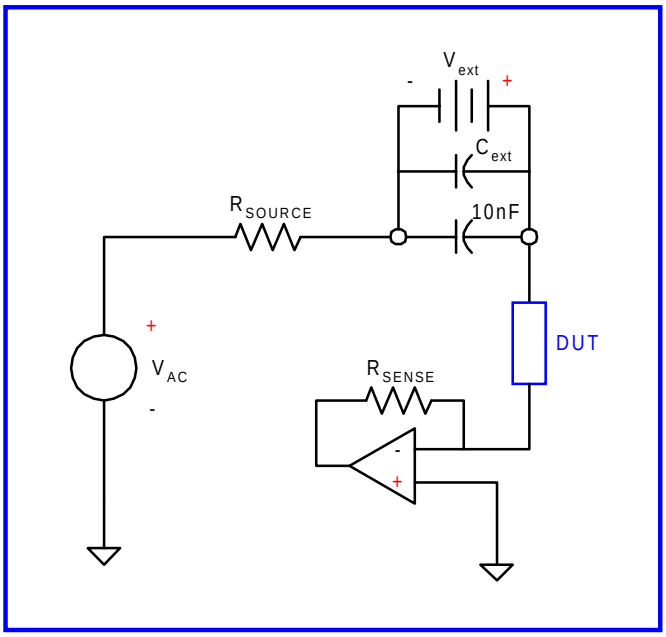

Figure 1: External Bias Circuit for 7000 Series Precision LCR Meter

Figure 2: 7400 Precision LCR Meter

External Bias Precautions

Isolation

The external supply must be isolated from ground. For proper isolation neither the positive nor negative terminals can have more than 100pF of stray capacitance to ground.

External Power Supply AC Impedance

The external power supply is internally bypassed by 10nF. If the customer-supplied power supply, Vext, has very low impedance at the frequency of measurement in comparison with the impedance of the device under test, or if the device under test has a capacitance less than 1nF, then this is the only bypassing required. However, if this is not the case then it is essential that the customer connect an external capacitor Cext that is 10 times the capacitance of the device under test.

DC Device Impedance

The external bias circuitry is designed for use in testing the impedance of devices with very low DC leakage, such as capacitors. With care devices such as varistors that have some DC leakage can be tested, provided certain precautions are observed. First, there is an inherent voltage divider between the source resistor Rsource that is internal and the DC impedance of the device under test. This results in a decrease in the DC Voltage at the device under test:

$$V_{dut} = V_{ext} \cdot \frac{R_{dut}}{R_{dut} + R_{source}}$$

Second, the DC leakage current can cause saturation in the current sense amplifier, depending on the range of impedance and the leakage current. This can lead to erroneous results under certain circumstances. The maximum current leakage depends on the applied AC voltage, the programmed impedance range and the device under test. Table 1 lists guidelines for the maximum allowable leakage current for different 7400/7600 impedance ranges.

Table 1: Maximum allowable DC Leakage Current for Each Impedance Range

Impedance Range	Maximum Allowable DC Leakage Current in Device under Test
25Ω	40mA
400Ω	2.5mA
6kΩ	0.16mA
95kΩ	0.01mA

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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