

# Problem: Noisy Readings in High Resistance Measurements

**Noisy readings prevent accurate measurements and reduce the effective resolution**

**Probable Cause: Electrostatic Coupling**

Electrostatic coupling is the most common reason readings may be noisy when making high resistance measurements (>10MΩ). Electrostatic interference occurs when an electrically charged object is brought near an uncharged object. At low impedance levels, the effects of the interference are not noticeable, because the charge dissipates rapidly. However, high resistance materials do not allow the charge to decay quickly, which may result in unstable measurements. Delays could be in the range of tens of seconds to several minutes, depending on the application. Shielding and guarding are both important with high resistance measurements.

**Remedies:**

A. *Shielding* usually is the use of a metallic enclosure to prevent electrostatic interference from affecting a high impedance circuit. A shield can be built to enclose

the circuit being measured. With this shield in place, the noise current generated by the electrostatic voltage source and the coupling capacitance flows through the shield to ground, rather than through the signal conductors. The easiest shield to make is a simple metal box or mesh screen that encloses the test circuit and is connected to the low impedance point on the measurement instrument. If this point is floating above ground, then observe special safety precautions to prevent

any shock hazard. It is also important to shield the cabling.

B. *Guarding* is the use of an added low impedance conductor, maintained at the same potential as the high impedance circuit, which will intercept any interfering voltage or current. The guard can be connected to the instrument's guard terminal, if available, or fed from an external buffer amplifier. A guard does not necessarily provide electrostatic shielding.

KEITHLEY

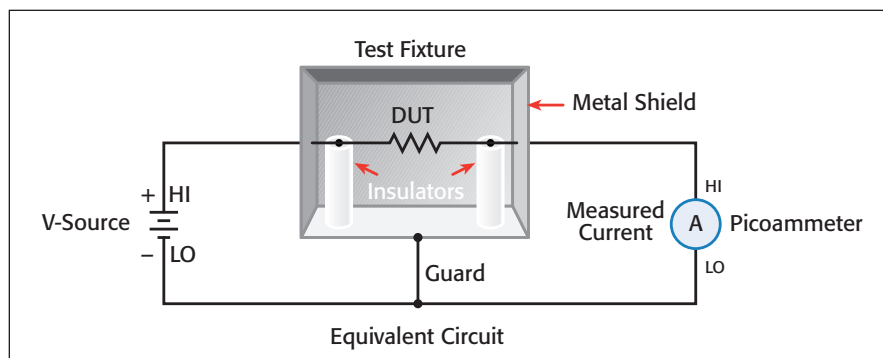


Figure 1. Guarding to reduce leakage currents

Specifications are subject to change without notice.  
All Keithley trademarks and trade names are the property of Keithley Instruments, Inc.  
All other trademarks and trade names are the property of their respective companies.

**KEITHLEY**

A G R E A T E R M E A S U R E O F C O N F I D E N C E

**KEITHLEY INSTRUMENTS, INC.** ■ 28775 AURORA ROAD ■ CLEVELAND, OHIO 44139-1891 ■ 440-248-0400 ■ Fax: 440-248-6168 ■ 1-888-KEITHLEY ■ [www.keithley.com](http://www.keithley.com)

**BELGIUM**

Sint-Pieters-Leeuw  
Ph: 32-2363-0040  
Fax: 32-2363-0064  
[www.keithley.nl](http://www.keithley.nl)

**CHINA**

Beijing  
Ph: 8610-82255010  
Fax: 8610-82255018  
[www.keithley.com.cn](http://www.keithley.com.cn)

**FINLAND**

Espoo  
Ph: 358 9 88171661  
Fax: 358 9 88171662  
[www.keithley.com](http://www.keithley.com)

**FRANCE**

Saint-Aubin  
Ph: 33-1-6453-2020  
Fax: 33-1-60-1-77-26  
[www.keithley.fr](http://www.keithley.fr)

**GERMANY**

Germering  
Ph: 49-89-84-93-070  
Fax: 49-89-84-93-0734  
[www.keithley.de](http://www.keithley.de)

**UNITED KINGDOM**

Theale  
Ph: 44-118-929-7500  
Fax: 44-118-929-7519  
[www.keithley.co.uk](http://www.keithley.co.uk)

**INDIA**

Bangalore  
Ph: 91-80-2212-8027  
Fax: 91-80-2212-8005  
[www.keithley.com](http://www.keithley.com)

**ITALY**

Milano  
Ph: 39-02-55 38 421  
Fax: 39-02-55 38 42 28  
[www.keithley.it](http://www.keithley.it)

**JAPAN**

Tokyo  
Ph: 81-3-5733-7555  
Fax: 81-3-5733-7556  
[www.keithley.jp](http://www.keithley.jp)

**KOREA**

Seoul  
Ph: 82-2-574-7778  
Fax: 82-2-574-7838  
[www.keithley.co.kr](http://www.keithley.co.kr)

**MALAYSIA**

Kuala Lumpur  
Ph: 60-3-4041-0899  
Fax: 60-3-4042-0899  
[www.keithley.com](http://www.keithley.com)

**NETHERLANDS**

Gorinchem  
Ph: 31-1-836-35333  
Fax: 31-1-836-30821  
[www.keithley.nl](http://www.keithley.nl)

**SINGAPORE**

Singapore  
Ph: 65-6747-9077  
Fax: 65-6747-2991  
[www.keithley.com.sg](http://www.keithley.com.sg)

**SWEDEN**

Solna  
Ph: 46-8-509-04-600  
Fax: 46-8-655-26-10  
[www.keithley.com](http://www.keithley.com)

**TAIWAN**

Hsinchu  
Ph: 886-3-572-9077  
Fax: 886-3-572-9031  
[www.keithley.com.tw](http://www.keithley.com.tw)