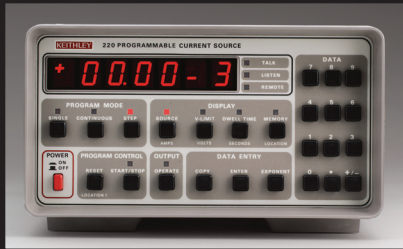


# 220/6514



The Model 220 Current Source offers material researchers  $\pm 0.5\text{pA/step}$  to  $\pm 101\text{mA}$  DC output, combined with  $10^{14}\Omega$  output resistance.



The Model 6514 Electrometer provides  $>200\text{T}\Omega$  input impedance and  $<3\text{fA}$  input bias current.

## Ordering Information

- 220 Programmable Current Source
- 6514 Programmable Electrometer

Extended warranty, service, and calibration contracts are available.

## ACCESSORIES AVAILABLE

- 2000 Digital Multimeter
- 6167 Guarded Input Adapter

### CABLES

- 7024-10 Triax Cable, 3m (10 ft)
- 7025-10 Low Noise Triax Input Cable, 3m (10 ft)
- 7078-TRX-10 Triax Cable, 3m (10 ft) (2 required)

# High Impedance Hall Effect Test System

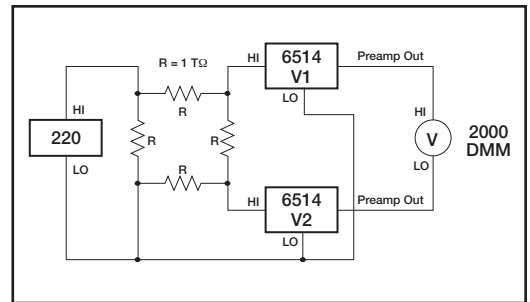
## Alternative economical approaches to Hall coefficient and resistivity measurements

Occasionally, when working with samples with very high resistivity, semi-insulating GaAs, and similar materials with resistivities above  $10^8\Omega$ , alternative system configurations may be able to produce more reliable data than standard, pre-configured Hall Effect systems. Such systems demand careful shielding and guarding, and typically include a current source, two electrometer buffers, and an isolated voltmeter. The schematics show two suggested configurations for these high resistivity applications: one that requires manual switching and one with automated switching.

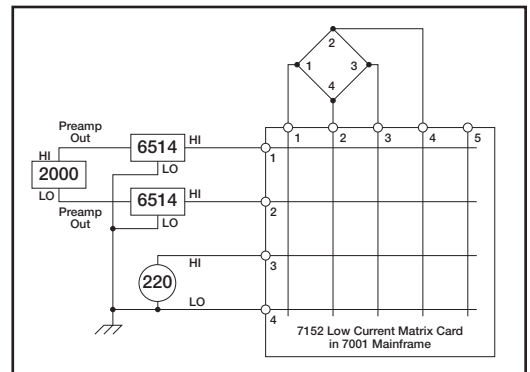
The range of the systems shown here is very wide. The high resistance end is limited by the minimum output of the current source. A current of  $100\text{pA}$  can be supplied with an accuracy of about 2%. If the resistance of each leg of the sample is no more than  $1\text{T}\Omega$ , the maximum voltage developed will be  $100\text{V}$ , within the range of the Model 220 current source and the Model 6514 electrometer. This system will provide good results with samples as low as  $1\Omega$  per leg, if a test current level of  $100\text{mA}$  is acceptable. Even at  $100\text{m}\Omega$  per leg, accuracy is approximately 2%.

Leakage currents are the most important sources of error, especially at very high resistances. One important advantage of this circuit is that a guard voltage is available for three of the sample terminals, which virtually eliminates both leakage currents and line capacitance. The fourth terminal is at circuit LO or ground potential and does not need guarding.

Call Keithley for additional guidance in selecting equipment for specific high resistivity applications.



The equipment configuration with manual switching (above) was developed for very high resistance van der Pauw or Hall Effect measurements. This measurement system includes a Model 220 current source, two Model 6514 electrometers (used as unity-gain buffers) and a Model 2000 digital multimeter (DMM). The current source is used with a Model 6167 guarded input adapter, which minimizes the time constant of the current source and cable. A Model 7024-10 triax cable connects the source, and two Model 7078-TRX-10s connect the electrometers. Two insulated banana leads are used to connect the digital multimeter to the pre-amp outputs for the electrometers. The insulation resistance of the leads and supporting fixtures for the sample should be at least 100 times the leg resistance (R). The entire sample holder must be shielded to avoid electrostatic pickup. If the sample is in a dewar, this should be part of the shield.



One Model 7152 Matrix Card, housed in a Model 7001 mainframe, is used to connect the electrometers and the current source to the sample. Two Model 6514 Electrometers are used as unity gain buffers, and their output difference is measured with a Model 2000 DMM. To ensure faster measurement time, guarded measurements are made by turning the Guard switch ON for both of the Model 6514s, and by guarding the Model 220 output using a Model 6167 guarded input adapter. Call Keithley's Applications department for cabling information.

Hall Effect systems for high resistivity applications

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