

Broadband Signal Routing Solutions



KEITHLEY

A GREATER MEASURE OF CONFIDENCE

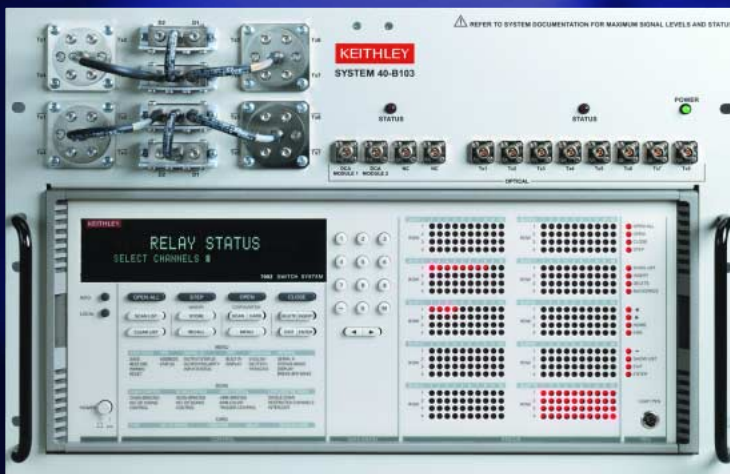
Broadband signal routing solutions for tomorrow's

A WIDE RANGE OF BROADBAND SOLUTIONS



DC, RF/microwave, and optical switching for testing

- Cellular and cordless phones
- Personal digital assistants(PDA)
- Specialized mobile radios
- Base stations
- Industrial wireless products
- Medical wireless products
- Specialized antenna systems
- RF components, including RFICs
- Semiconductor device characterization
- Wireless peripherals, including Bluetooth and 802.11 devices
- Switching power supplies
- Broadband wireless transceivers
- High speed digital communications (SONET/SDH OC) components
- Laser diode modules
- Optical add/drop multiplexers(OADMs)



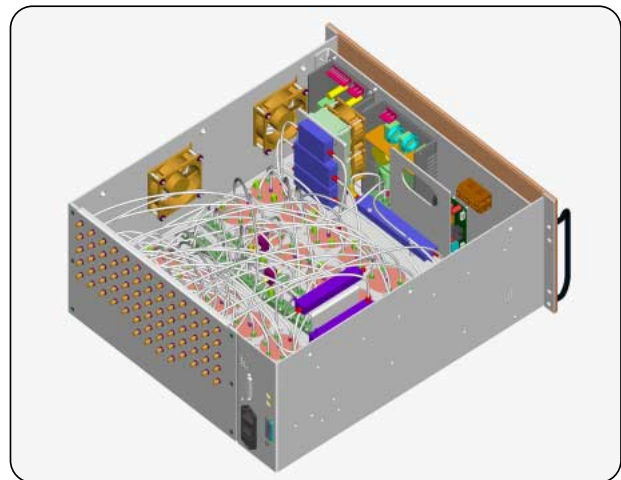
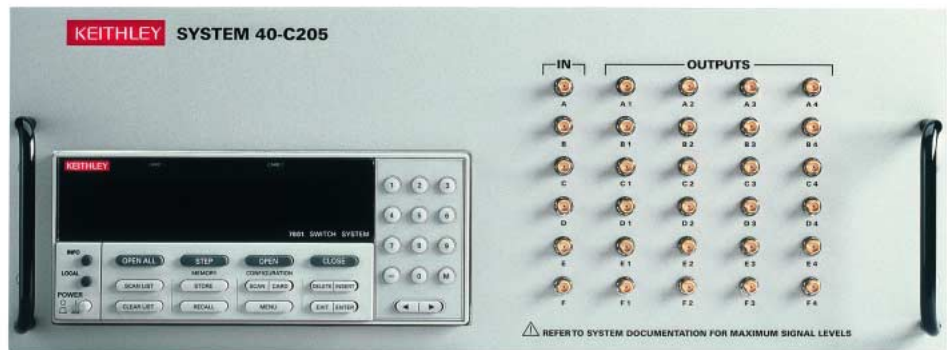
testing challenges



Since 1946, Keithley Instruments has been building its reputation by helping engineers and scientists solve their test and measurement problems quickly, accurately, and cost-effectively. Today, we're continuing to build on that innovative tradition, offering manufacturers of sophisticated broadband devices and systems the signal routing solutions they need to maintain signal integrity while increasing test throughput. Our RF applications engineers and manufacturing specialists use the latest design techniques, RF/microwave relay technologies, and manufacturing practices to create practical, reliable broadband switching solutions for a wide range of applications.

Keithley has developed a line of signal routing solutions that range from simple RS-232 controlled switches to fully customized hybrid signal routing systems for handling multiple signal types. These hybrid systems can be configured for applications that require signal routing, such as low frequency, optical, RF/microwave, and power switching.

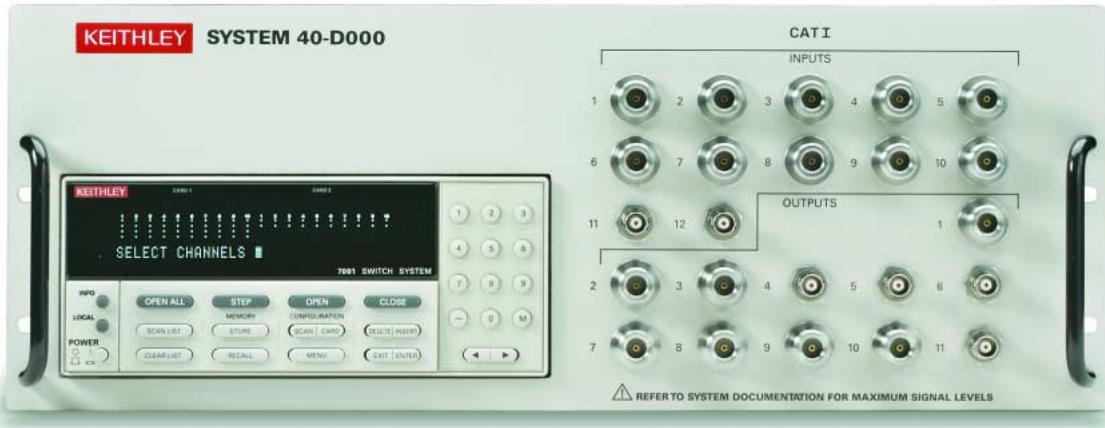
To build Keithley broadband switch systems, we combine proven Keithley switch mainframes with a wide array of relays and other components sourced from the industry's leading suppliers. This flexibility to choose the best RF/microwave and optical components for the application, regardless of the supplier, means there's no compromise on system performance.



Keithley uses Parametric Technology Corporation's Pro/ENGINEER CAD software to design our broadband signal routing solutions to ensure ongoing system reliability and repeatability.

System 40—the ultimate in hybrid switching

CUSTOM DESIGN CAPABILITIES FOR UNIQUE APPLICATIONS



System 40 with bulkhead connectors

System 40 signal routing solutions are designed and built to customer specifications to match specific requirements for DC, RF/microwave, and optical applications. Keithley's custom design capabilities allow system specifiers to define the key design parameters within their applications. For example, Keithley can design a system to meet any switching configuration, including multiplexers, matrices, or a combination. A System 40 can also include signal conditioning elements such as combiners, splitters, and attenuators, or can be designed to meet critical RF/microwave electrical specifications.

Built around a standard Model 7001 or 7002 controller, the System 40 is delivered complete with built-in local and remote GPIB control, continuous real-time channel status, system power supply, all power and control cables, and rack mounting hardware. Each System 40 is pre-programmed at the factory with actual switch pathways, minimizing the time required for system setup.

Features:

- Integrate RF/microwave, optical, and low frequency switching for a unique hybrid solution.
- Fully customizable chassis.
- RF/microwave switches, including SPDT, multipole up to SP12T, and transfer switches.
- RF/microwave component integration, including:
 - Fixed and programmable attenuators.
 - Isolators, circulators, filters, splitters.
 - Couplers, dividers, combiners, amplifiers.



System 40 with integrated signal conditioning

customization

The System 40 offers a complete RF/microwave and optical switching solution.



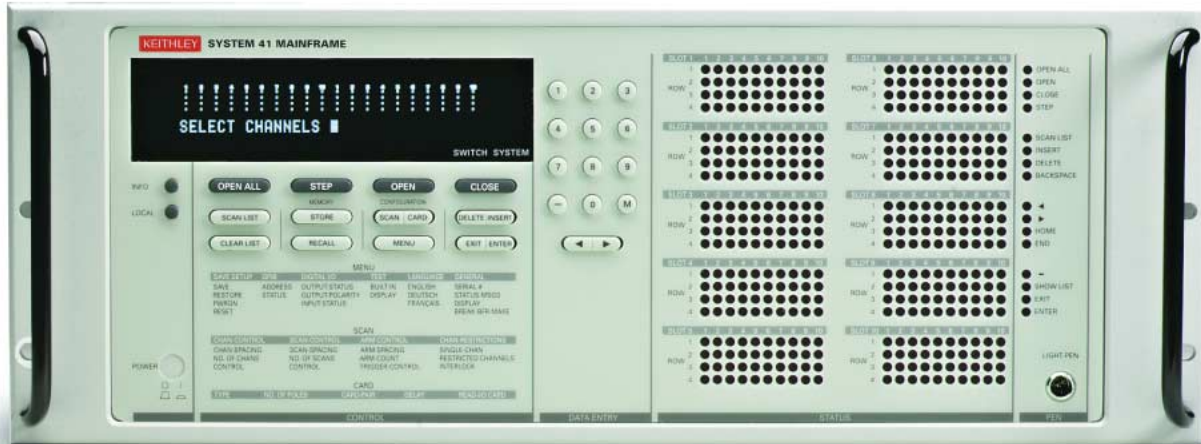
- Optical status LEDs.
- Bulkhead mounted optical interconnects.
- Securely routed fiberoptic cabling.

- D-sub quick disconnects to multithrow switches.
- Panel mounted switches minimize RF/microwave cabling.

- Signal routing paths are pre-programmed into the controller at the factory.
- A separate “power-on” LED confirms the switch control power status.
- Rack-mountable package, including fully integrated controller and switching devices.
- Series 7000 cards can be plugged into any unused slots to control other system functions.

System 41—the optional choice for standard or custom RF/microwave switching

CONTROL UP TO 240 RF/MICROWAVE CHANNELS



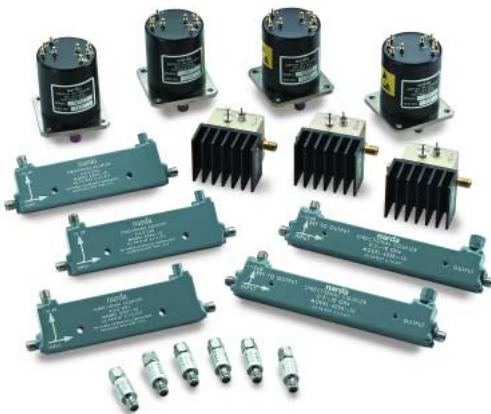
The System 41 with an interactive front panel.

The System 41 is optimized for RF/microwave signal routing applications. It provides the ability to control up to 240 RF/microwave channels within a seven-inch-high chassis. To enhance accessibility, switches are mounted on an easily removable RF module. Standard RF modules are available or a custom RF module can be designed to fit a specific application.

- LED channel status display.
- Local and remote GPIB operation.
- Light pen allows easy front panel programming.

Standard modules for 18GHz switching include:

- 6x6 non-blocking matrix.
- 10x10 non-blocking matrix.
- 1x72 multiplexer.
- Two individual 1x36 multiplexers.
- Custom modules are available.



By integrating components from leading suppliers, Keithley's switch systems provide superior RF/microwave performance.



A removable tray design allows easy access to system components for faster maintenance and repair.

Choose from a range of economical standard solutions



System 46 Microwave Switch Solution

The System 46 is a low cost, quickly deliverable 18GHz switch system. The unit supports up to eight single-pole, double-throw (SPDT) and four multipole relays (SP4T to SP6T) in a small 2U high (3.5 inch) full-rack enclosure.

- LED channel status display.
- Automatic relay contact counters.
- Characterization data storage.
- Optional relay kits allow for future expansion or switch replacement.

Model 7999-4 Switch and 7999-5 RS-232 Relay Controller

These compact stand-alone units are ideal for production test applications—their small packages make them easy to locate just about anywhere in the test environment, minimizing required cabling and increasing signal integrity. The Model 7999-4 contains a single-pole, double-throw (SPDT) 18GHz switch packaged in a compact enclosure. The Model 7999-5 is a 16-channel switch controller with 16 open collectors. Each of its open collectors can sink 300mA at 28VDC, allowing them to control switches and other devices. Both models include an RS-232 control interface.



Model 7116-MWS Switch System

When the application does not require the extended flexibility of a custom system, this pre-configured solution can accommodate RF/microwave signal switching for a wide range of communication devices and systems. It is configurable as one 1x16 or five independent 1x4 multiplexers. It includes a switch control unit and RF/microwave coaxial relays with a bandwidth from DC to 18GHz.

- Channel status display and full control keypad.
- Easy access to RF input/output connections from front panel permits easy maintenance and reconfiguration.
- Spare slot for additional Series 7000 switch cards.



Models 7999-4 and 7999-5

Broadband signal routing solutions start with standard Keithley

Model 7001 80-Channel Switch System

TWO-SLOT SWITCH CONTROLLER FOR SMALLER SYSTEMS

Channel Status Display
Shows the open and closed status of each channel

Open Channels and Stop Scanning
Single-key operation.

On-Line Help
Context-sensitive information provided with the push of a single key.

Manual Scan
Manually scan sequence through the scan list.

Channel Open/Close Toggle
Open and close a channel or list of channels without re-entering the channel numbers.

Shorthand Entry Notation
Enter a list of contiguous channels or memories without entering each individually.

Key Pad
Makes channel selection fast and easy.

Scan Through Memory
Memory locations can be included in the scan list.

Edit the Scan or Channel List

Easy Card Configuration

- Number of Poles
- Card Pair
- Channel Delay

Mainframe Configuration

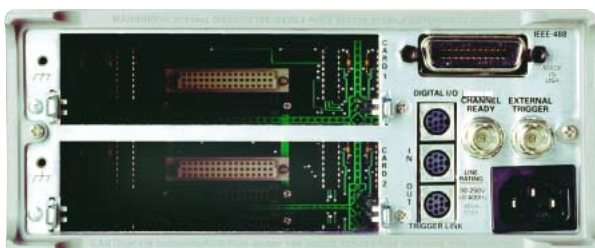
- Save 10 setups
- Digital I/O control
- IEEE address
- Serial number
- Self test

Select Scan Sequence
Scan through channels in any order. Also scan through memory.

100 Memory Locations
Store and recall complete switch patterns in non-volatile memory.

Scan Control

- Channel spacing
- Scan spacing
- Number of scans
- Triggering
- Channel restrictions



Model 7001 Rear-Panel Digital I/O

The Model 7001 can provide digital control through four open collector outputs (each sinks up to 100mA) and one TTL input. These features are standard, do not take up a card slot, and can be controlled via the front panel or IEEE bus.

switch controllers



Model 7002 400-Channel Switch System

Scan Control

- Channel spacing
- Scan spacing
- Number of scans
- Triggering
- Channel restrictions

Manual Scan Manually scan sequence through the scan list.

Open Channels and Stop Scanning Single-key operation.

On-Line Help Context-sensitive information provided with the push of a single key.

Select Scan Sequence Scan through channels in any order. Also scan through memory.

500 Memory Locations Store and recall complete switch patterns in non-volatile memory.

Mainframe Configuration

- Save 10 setups
- Digital I/O control
- IEEE address
- Serial number
- Self test

Easy Card Configuration

- Number of Poles
- Card Pair
- Channel Delay

Multilingual Messages and prompts can be displayed in three languages.

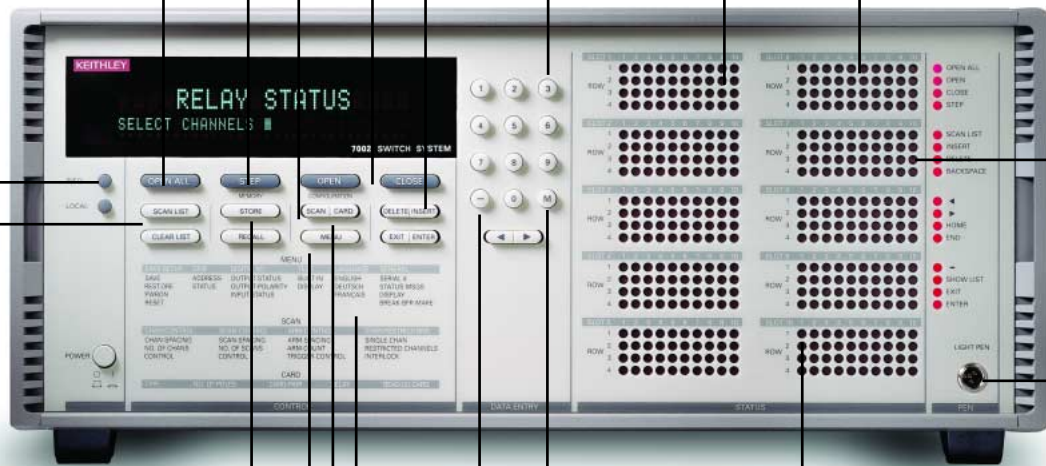
Channel Open/Close Toggle open and close a channel or list of channels without re-entering the channel numbers.

Edit the Scan or Channel List

Key Pad Makes channel selection fast and easy.

Open Channel **Closed Channel**

Matrix Card Displayed Only the available rows and columns of the card are displayed. Rows are horizontal and columns are vertical.



Scan Through Memory Memory locations can be included in the scan list.

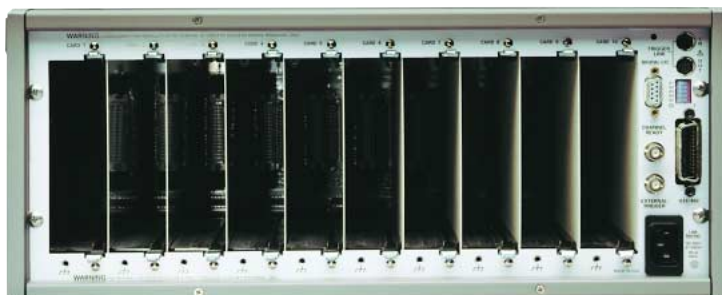
Multiplexer Card Display The first row across represents channels 1 to 10. The second row is channels 11 to 20. Only the available channels are displayed.

Light Pen provides functional programming with simple point and click operation to open or close the desired channel or crosspoint.

Shorthand Entry Notation

Enter a list of contiguous channels or memories without entering each individually.

TEN-SLOT CONTROLLER HAS ROOM TO GROW



Model 7002 Rear-Panel Digital I/O

The Model 7002 can provide digital control through four open collector outputs (each sinks up to 100mA) and one TTL input. These features are standard, do not take up a card slot, and can be controlled via the front panel or IEEE bus.

Standard plug-in solutions for mixed signal routing

Switch cards for Model 7001 and 7002 switch controllers

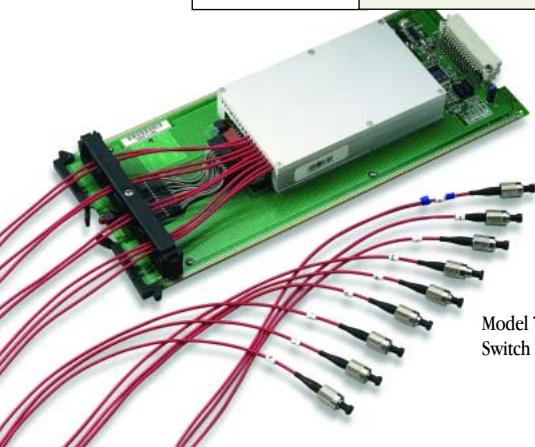
SERIES 7000 PLUG-IN SWITCH/CONTROL CARDS

Category	Model Number	Configuration	Max. Frequency, Typical	Connector Type
RF	7016A	Dual 1x4 Multiplexers, 50Ω	2GHz	SMA
	7017	Dual 1x4 Multiplexers, 50Ω	800MHz	SMA
	7038	Three 1x4 Multiplexers, 75Ω	2GHz	SMB
	7062	Dual 1x5 Multiplexers, 50Ω	500MHz	BNC
	7063	Dual 1x5 Multiplexers, 50Ω, Terminated	500MHz	BNC
General Purpose	7011	Quad 1x10 Multiplexers	2MHz	Multiple Styles
	7018	Two 1x14 Multiplexers	2MHz	Multiple Styles
	7020	40 Digital I/O	N/A	Multiple Styles
	7035	Nine 1x4 Multiplexers	10MHz	96-pin DIN
	7053	10-Channel, 5 Amp	1MHz	Screw Terminals

More than 40 different Series 7000 switch control cards are available. For detailed specifications, refer to our catalog or www.keithley.com

SERIES 7000 PLUG-IN SWITCH/CONTROL CARDS

Category	Model Number	Configuration	Wavelength (nm)	Connector Type
Optical	7090-4-1	1x4 Multiplexer, Single mode fiber	1290–1650	FC/APC
	7090-4-2BH	1x4 Multiplexer, Single mode fiber	1290–1650	FC/SPC
	7090-8-3	1x8 Multiplexer, Single mode fiber	1290–1650	FC/APC
	7090-8-4	1x8 Multiplexer, Multimode fiber	780–1350	FC/SPC
	7090-8-5	1x8 Multiplexer, Single mode fiber	1290–1650	FC/SPC
	7090-16-6	1x16 Multiplexer, Single mode fiber	1290–1650	FC/SPC
	7090-16-7	1x16 Multiplexer, Single mode fiber	1290–1650	FC/APC



Model 7090 Optical Switch Card

and measurements

Model 2700 and 2750 switch/measure systems

The Model 2700 and Model 2750 are fully integrated, off-the-shelf measurement and control systems. These cost-effective, high performance test platforms offer affordable alternatives to separate DMMs and switch systems, dataloggers/recorders, plug-in card data acquisition equipment, and VXI/PXI systems.



SERIES 2700 PLUG-IN SWITCH/CONTROL MODULES				
Category	Model Number	Configuration	Max. Frequency, Typical	Connector Type
RF	7711	Dual 1x4 Multiplexers, 50Ω	2 GHz	SMA
	7712	Dual 1x4 Multiplexers, 50Ω	3.5GHz	SMA
General Purpose	7701	1x32 or two 1x16 Multiplexers	2MHz	D-Sub (IDC style)
	7702	1x40 or two 1x20 Multiplexers	2MHz	Screw Terminals
	7703	1x32 or two 1x16 Multiplexers	2MHz	D-Sub (solder or crimp)
	7705	40-Channel Independent SPST	10MHz	D-Sub (solder or crimp)
	7707	1x10 or two 1x5 Multiplexers plus 32 Digital I/O	2MHz	D-Sub (IDC style)
	7709	6x8 Matrix	2MHz	D-Sub (IDC Style)
	7700	1x20 or two 1x10 Multiplexers	2MHz	Screw Terminals
General Purpose with Built-in Thermocouple Support	7706	1x20 or two 1x10 Multiplexers plus 2 Analog Outputs and 16 Digital Out	2MHz	Screw Terminals
	7708	1x40 or two 1x20 Multiplexers	2MHz	Screw Terminals

Are you ready for Keithley switching performance?

A greater measure of confidence

With more than a half-century of expertise in making demanding low level measurements, Keithley offers its customers a greater measure of testing confidence on the production floor, in the QA lab, and in R&D. For more information on how Keithley test solutions can help you keep pace with changing technologies, call your local Keithley sales engineer or visit our website.



Switching Handbook

Request a FREE copy of Keithley's Switching Handbook. The fourth edition of this popular reference describes switching components, topologies, functions, relay characteristics, etc. It also provides selection criteria, system integration hints, guidelines for optimizing test systems, and application examples. Also, be sure to check out Keithley's website for downloadable technical literature, including articles, application notes, and white papers on automated switching. A new white paper titled "Product Testing Where RF Meets Broadband—Convergence of RF, Optical, and Digital Test Environments" offers valuable insights on high speed digital switching solutions.

Keithley's expert applications engineers are here to help

Selecting and configuring a switch system can sometimes be confusing. For example, which switch topology is best for your application? Which type of relay should you use? Ask to talk with one of the broadband switching experts on Keithley's Applications Engineering team. They're here to help you solve your toughest RF/microwave switching challenges, before and after the sale.

All the support you need

For applications assistance, call us on our toll-free hotline **1-888-KEITHLEY (534-8453)** from 8:00 am to 5:00 pm ET (U.S. only). If you need assistance beyond those hours, send our Applications Engineering Department a facsimile (440-248-6168) or an e-mail message (product_info@keithley.com) and we'll respond as soon as possible. Applications assistance is also available via the web, with many reference materials available online, as well as convenient forms for contacting our Applications Engineers. Keithley maintains facilities and affiliates worldwide, which offer native language support services. Visit our website for current listings: www.keithley.com

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