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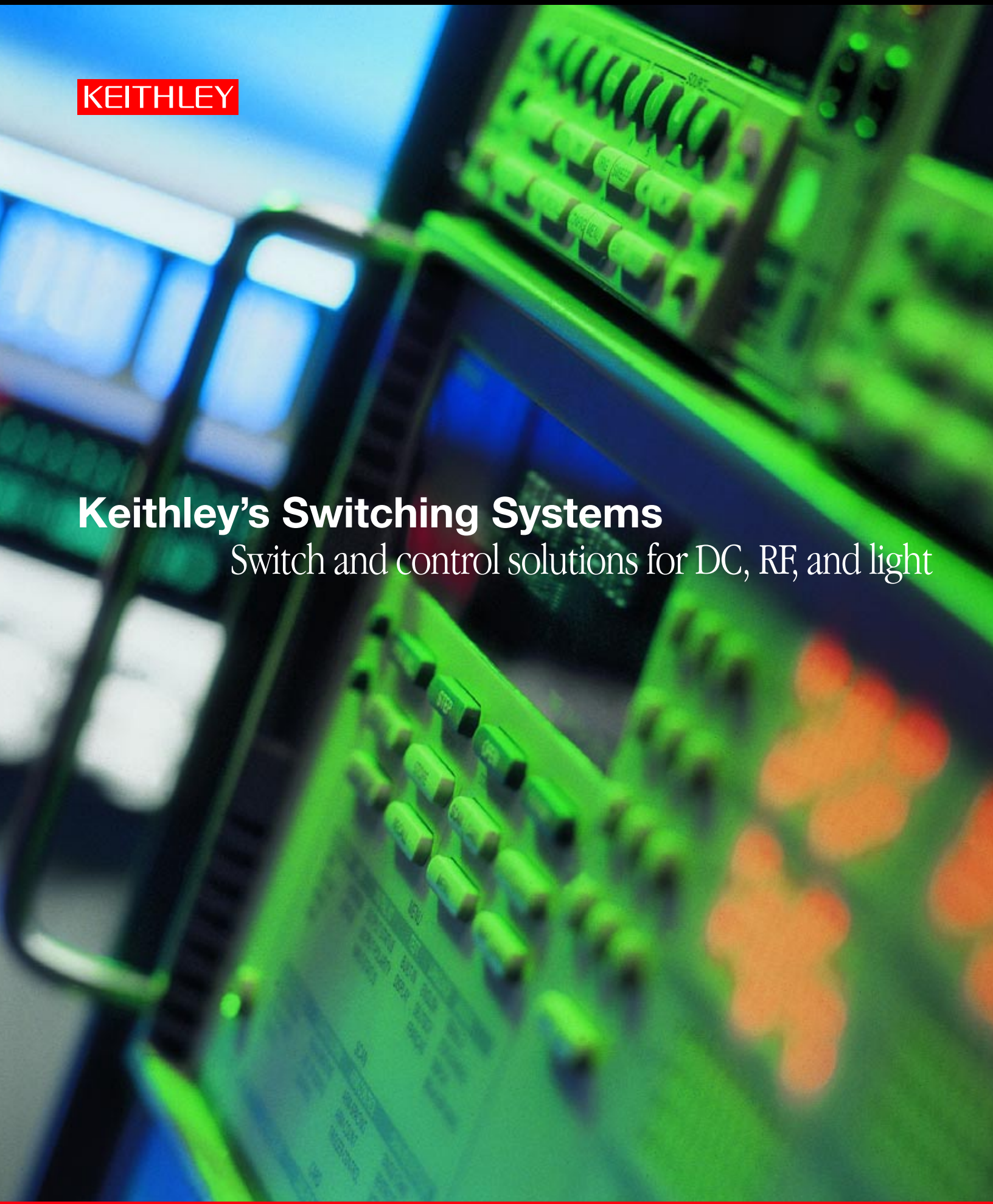
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KEITHLEY

Keithley's Switching Systems

Switch and control solutions for DC, RF, and light



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A wide array of high integrity switch systems

Robust and reliable















HIGH-CHANNEL-COUNT TEST SOLUTIONS

Our switch systems combine the most sensitive signal routing in the industry with high ease of use.

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routing for all types of signals

Keithley's great selection of switch systems makes it easy to configure the optimum solution for just about any application. Both standard and custom solutions are available. Whether the application demands a switch matrix or multiplexer, or involves routing DC, RF, microwave, optical, or digital I/O signals, Keithley offers a variety of high performance, cost-effective solutions. Our switch systems:

Support a **broad mix of signals** to accommodate virtually any application's requirements

Allow **quick and easy** development, verification, and troubleshooting of automated test systems with well-designed front panels and remote interfaces

Ensure **reliable, repeatable results**

Route low level signals **without** introducing **errors**

Make the most of limited test rack space

Come with **outstanding technical support** from our team of experienced Applications Engineers

Keithley has earned a reputation for designing and producing high quality switch systems. Count on them to preserve measurement integrity while increasing production test throughput and efficiency. Our systems have been carefully designed and rigorously tested to ensure high reliability and long, robust life.

EASY TO CONFIGURE THE OPTIMUM SOLUTION

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Industry leading switching performance for building powerful test systems

HIGHEST DENSITY, LOWEST COST SOLUTION

MAINFRAMES								
	Summary	**Typical Applications**	**Model Number**	**Card Slots**	**Max No. of Channels or Crosspoints per Chassis**	**Expandability**	**Switch/ Control Cards Available**	**Front Panel**
ATE Switch/Control Systems 	• Widest signal range • More than 40 switch and control cards with DC, RF, and optical switching capability and digital I/O for control • Great user interface for front panel operation and debugging	• Wide range of production test applications, including functional test of components, sub-assemblies, and systems • Multipoint, sensitive measurements	**7001**	2	Up to 80 per mainframe	With Trigger Link	More than 40	Full status display with programming control
			7002	10	Up to 400 per mainframe	With Trigger Link	More than 40	Full status display with interactive programming
Semiconductor Test System Switching 	• Mixed signal switching for DC and RF • Large scale matrix and multiplexer capability • Ultra-low current capability • Compatible with Keithley and Agilent parameter analyzers	• Semiconductor device characterization • C-V testing • Semiconductor reliability testing • Modeling	**707A**	6	Up to 576 per mainframe	Master/Slave 5 mainframes for 2880 channels	14	Full status display with interactive programming
			708A	1	Up to 96 per mainframe	Master/Slave 5 mainframes for 480 channels	14	Full status display with interactive programming
RF/Microwave Switch Systems 	• Hybrid solutions for RF/microwave, optical, and low frequency switching • Standard and custom signal routing solutions • RF/microwave switching up to 40GHz • Integration of switches and other RF components	• Cellular and cordless phones • RF components • Specialized mobile radios • Base stations • Wireless peripherals • Broadband wireless transceivers • High speed digital communications	**System 40**	Custom	Custom	Custom	More than 40	Full status display with programming control
			System 41	Custom	Up to 240 RF/microwave chs.	Custom	—	Full status display with programming control
			System 46	0	Up to 32 RF/ microwave chs.	NA	—	Status display
			7116-MWS	1	20 RF/microwave and 40 general purpose chs.	NA	More than 40	Full status display with programming control
Switch/Measure Systems 	• Highest density, lowest cost solution • Integrated multimeter • Fully automatic thermocouple measurements	• Burn-in/data logging applications • Production test • Connector testing and other low ohms applications	**2700**	2	Up to 80 channels or 96 crosspoints per mainframe	With Trigger Link	9	Multimeter display
			2750	5	Up to 200 channels or 240 crosspoints per mainframe	With Trigger Link	9	Multimeter display

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		SWITCH/CONTROL CARDS								
		DC								
Built-in Digital I/O	IEEE-488 Bus	General Purpose V and I	Automatic Cold Junction Support for Thermocouples	Low Current	Low Voltage	High Current	High Voltage	RF	Optical	Integrated Multimeter
1 input/ 4 outputs	Yes	●		●	●	●	●	●	●	
1 input/ 4 outputs	Yes	●		●	●	●	●	●	●	
8 inputs/ 8 outputs	Yes	●		●			●	●		
16 inputs/ 16 outputs	Yes	●		●			●	●		
Custom	Yes	●		●	●	●	●	●	●	
—	Yes	●						●		
—	Yes							●		
1 input/ 4 outputs	Yes	●		●	●	●	●	●	●	
2 inputs/ 5 outputs	Yes	●	●					*		●
2 inputs/ 5 outputs	Yes	●	●					*		●

*Available in early 2002

BOTH MATRIX AND MULTIPLEXER CAPABILITY

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DC, RF, and optical switching all in one half-rack enclosure

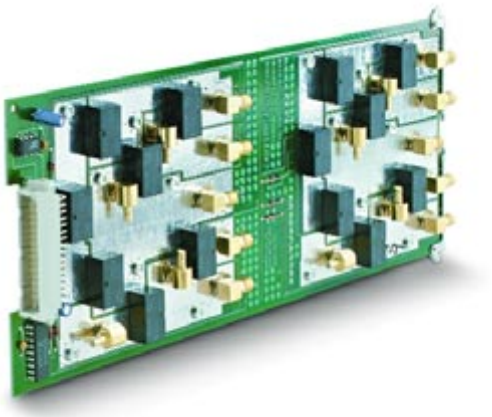
COMPACT, HALF-RACK DESIGN

Model 7001—packed with functionality for maximum simplicity and flexibility

The compact, half-rack design of the Model 7001 conserves precious rack space without sacrificing capability or ease of use. Its interactive front panel provides maximum functionality. This design makes it quick and easy to develop, verify, debug, monitor, and control an application. The Model 7001 also provides built-in scan control, accommodates the industry's broadest range of signals, and won't degrade signal integrity. If an application outgrows the Model 7001, it's simple to move it to the Model 7002 because both systems are software-compatible and share the same family of switch/control cards.

Features:

- Automatic card configuration. Just insert a card in a slot and the Model 7001 does the rest.
- Built-in scan control eliminates the need for computer control, providing higher production throughput.
- The Trigger Link function makes it easy to trigger multiple instruments within a test system without computer interaction, increasing speed and production throughput.
- Channel-status display and full control keypad shows the status of each channel simultaneously, making it easy to monitor or configure a test system, modify programs, and verify proper operation during debugging.
- Digital I/O available on the rear panel and on many switch/control cards.
- GPIB bus ensures reliable, high speed communications.

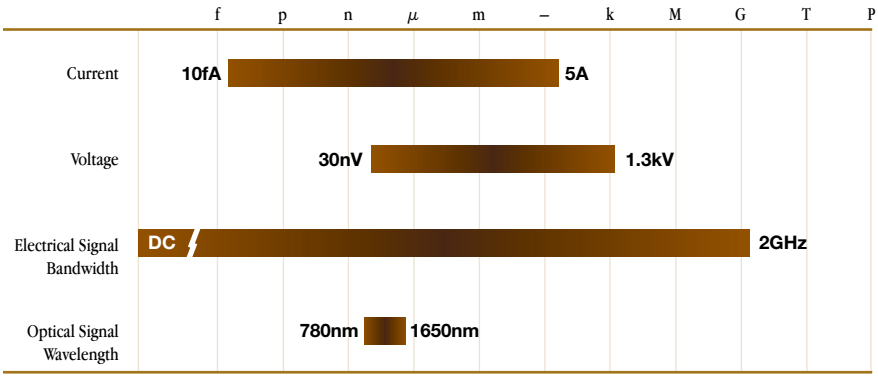


Specifications:

- Supports up to 80 channels or matrix crosspoints per mainframe.
- Includes two card slots.
- Holds 100 discrete channel patterns in non-volatile memory.
- Scans 165 channels/second.

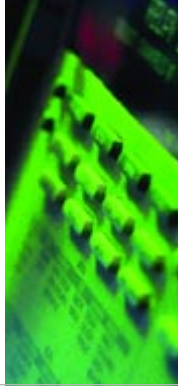
Series 7000 switch/control cards provide Keithley's broadest range of electrical and optical switching capabilities

The two slots in the Model 7001 mainframe support a family of more than 40 switch/control cards for routing the industry's widest range of electrical and optical signals for production test and sensitive measurement applications. These cards make it easy to assemble a switch configuration that will ensure signal integrity, minimize errors, and prevent degradation due to offset voltage, isolation resistance, and leakage current.



Range of signals supported by the Series 7000 switch/control cards

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Model 7001 80-Channel Switch and Control System

CHANNEL STATUS DISPLAY
Shows the open and close status of each channel.

MANUAL STEP
Step through a scan list one channel at a time.

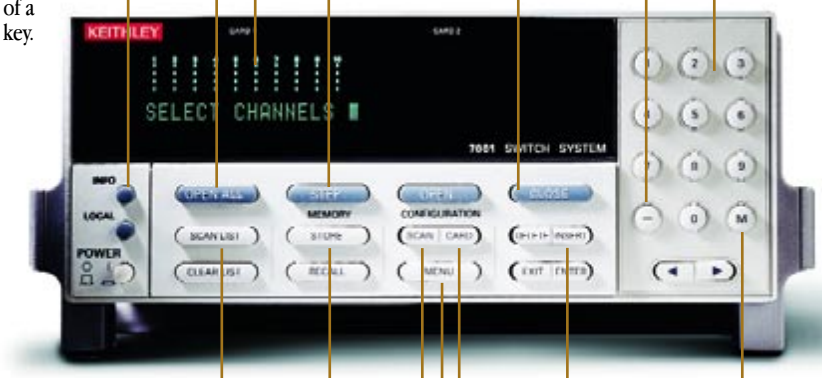
CHANNEL OPEN/CLOSE TOGGLE
Open and close a channel or list of channels without re-entering the channel numbers.

OPEN CHANNELS AND STOP SCANNING
Single-key operation.

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

ON-LINE HELP
Context-sensitive information provided with the push of a single key.

KEY PAD
Makes channel selection fast and easy.



SCAN THROUGH MEMORY
Memory locations can be included in the scan list.

SELECT SCAN SEQUENCE
Scan through channels in any order. Also scan through memory.

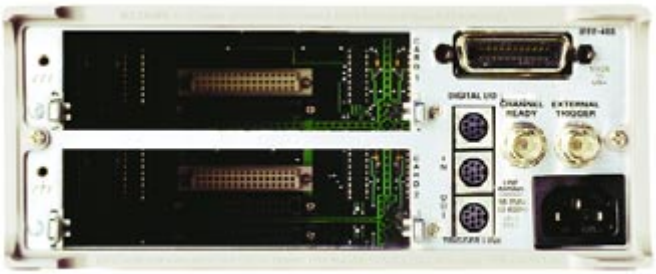
EDIT THE SCAN OR CHANNEL LIST

EASY CARD CONFIGURATION
- Number of poles
- Card pair
- Channel delay

100 MEMORY LOCATIONS
Store and recall complete switch patterns in non-volatile memory.

MAINFRAME CONFIGURATION
- Save 10 setups
- Digital I/O control
- GPIB address
- Serial number
- Self test

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



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. Trigger inputs and outputs allow timing coordination with multiple mainframes and external instruments significantly faster than with the GPIB bus.

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DC, RF, and optical switching for large-scale production

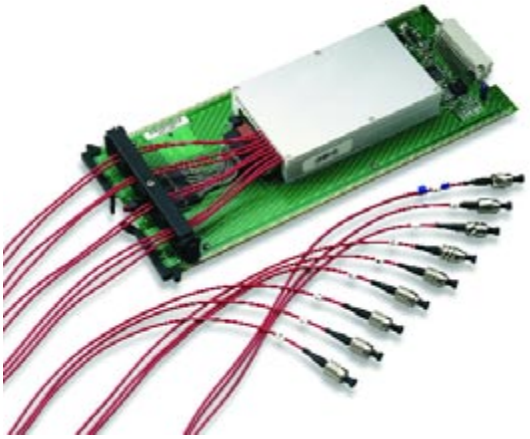
BROADEST RANGE OF SIGNALS IN THE INDUSTRY

Model 7002—for the most demanding applications

Keithley's Model 7002 High Density Switch System supports the broadest range of signals in the industry. This ten-slot mainframe combines high performance with exceptional versatility for building high quality matrix and multiplex switch configurations. Simple to set up, program, and use, it's ideal for switch and control applications involving voltage, current, RF, optical, and thermocouple signals, as well as digital I/O and signal routing tasks.

Features:

- Ten-slot flexibility simplifies building systems with high channels counts and diverse functionality.
- LED indicators continuously display the status of 400 channels on every card simultaneously.
- Optional light pen provides point-and-click programming from the front panel.
- Front panel control permits configuring the Model 7002 manually and displays error messages, on-line help, etc.
- Automatic card configuration. Plug in a card and the Model 7002 automatically configures the slot and displays the card's capacity and configuration on the front panel.
- The Trigger Link function makes it easy to trigger multiple instruments within a test system without computer interaction, increasing speed and production throughput.
- Digital I/O available on the rear panel and on many switch/control cards.
- GPIB bus ensures reliable, high speed communications.

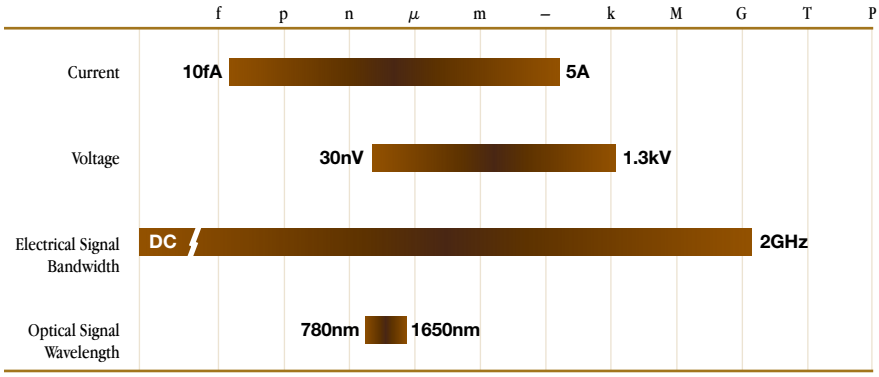


Specifications:

- Accommodates ten switch/control cards.
- Supports up to 400 two-pole multiplexer channels or matrix crosspoints.
- Scans 270 channels/second.
- Contains 500 memory locations.
- Just seven inches high.

Series 7000 switch/control cards provide Keithley's broadest range of electrical and optical switching capabilities

The Model 7002's ten card slots and more than 40 switch/control cards support the industry's widest range of signals and extremes in measurements. These cards allow switching signals from femtoamps to amps, nanovolts to kilovolts, DC to 2GHz, and optical wavelengths from 780nm to 1650nm.



Range of signals supported by the Series 7000 switch/control cards

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Model 7002 400-Channel Switch and Control System

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

CHANNEL OPEN/CLOSE TOGGLE
Open and close a channel or list of channels without re-entering the channel numbers.

MANUAL STEP
Step through a scan list one channel at a time.

EDIT THE SCAN OR CHANNEL LIST

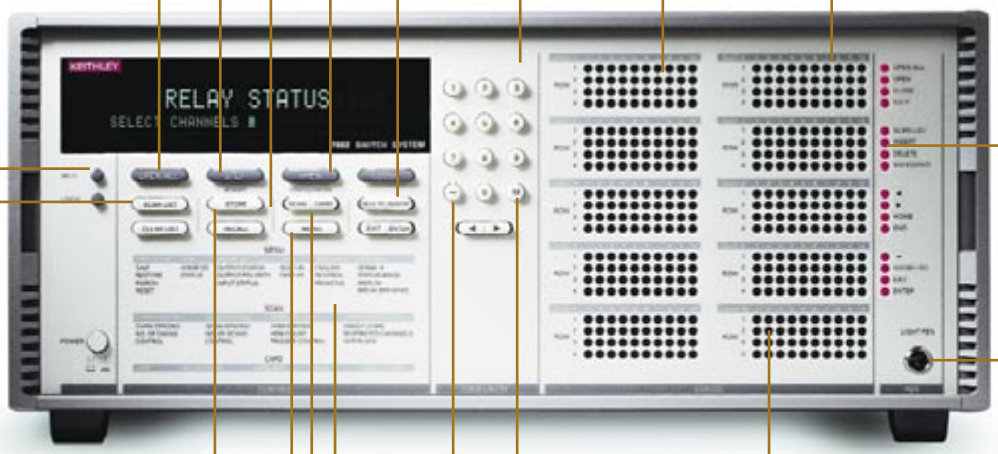
KEY PAD
Makes channel selection fast and easy.

OPEN CHANNELS AND STOP SCANNING Single-key operation.

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.



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.

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.

MAINFRAME CONFIGURATION
- Save 10 setups
- Digital I/O control
- GPIB address
- Serial number
- Self test

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

EASY CARD CONFIGURATION
- Number of poles
- Card pair
- Channel delay

MULTILINGUAL
Messages and prompts can be displayed in three languages.



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 GPIB bus. Trigger inputs and outputs allow timing coordination with multiple mainframes and external instruments significantly faster than with the GPIB bus.

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Semiconductor test system switching for characterization and reliability

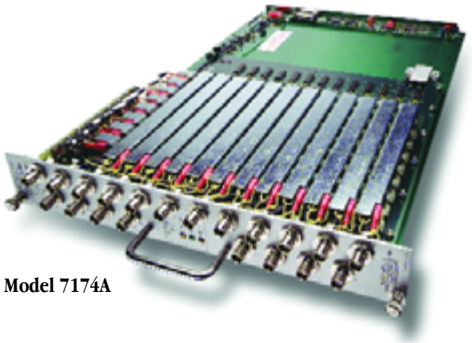
OUTSTANDING LOW CURRENT MATRIX CAPABILITY

Model 707A and 708A—large-scale matrix systems for world-class low current performance

The Model 707A and 708A provide outstanding low-current matrix capability and let you control up to 2880 channels or matrix crosspoints in real time. Their large matrix format makes them well suited for your large ATE system applications such as semiconductor device characterization, wafer level reliability, parallel test, and modeling. They are most often used in conjunction with Keithley's Model 4200-SCS semiconductor characterization system and Model 590 and 595 C-V analysis instrumentation.

Features:

- Fully configurable and controllable from the Model 4200-SCS characterization system front panel—for seamless integration in I-V and C-V applications.
- Easy integration with the Agilent 4155/56—gives industry wide compatibility.
- High capacity—with up to 6 cards linked via the Model 707A backplane you can build pin configurations of up to 8 rows × 72 columns per mainframe.
- Expandable—up to 5 mainframes can be connected through the master/slave feature and controlled from a single GPIB address.
- Fully interactive front panel with optional light pen control—for simple configuration in stand-alone applications.



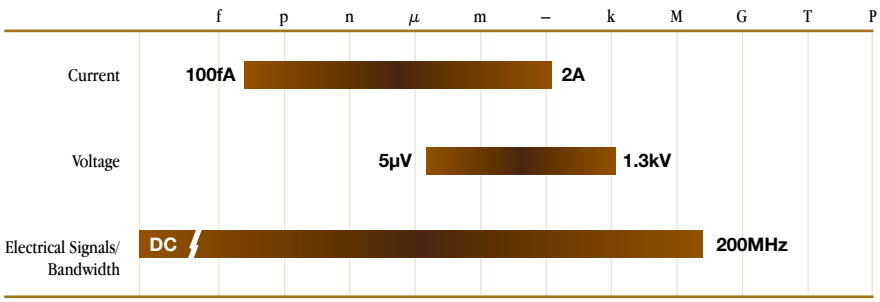
Model 7174A

Specifications of Model 707A/708A:

- Supports up to 576/96 channels, expandable to 2880/480 channels.
- Contains 6/1 card slot(s).
- Scans 200 channels/second.
- Contains 100 memory locations.
- Includes 16/8 digital inputs and 16/8 digital outputs.
- Fits into a 19 inch rack and is 14/3.5 inches high.

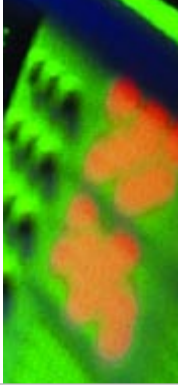
Switch/control cards for the Model 707A and 708A

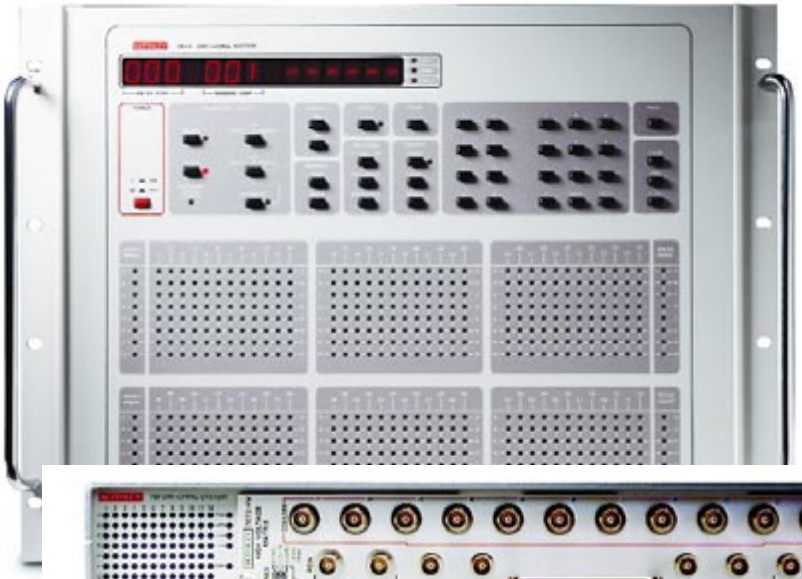
A family of more than a dozen switch/control cards designed for semiconductor characterization applications can be used in the Model 707A and 708A. Some of the switch cards are general purpose like the Model 7071, while others have very unique capabilities, such as the Model 7174A card, which is an 8 × 12 configuration with 10fA typical offset current on all signal paths. The Model 7072 card combines low current and high frequency capability for C-V characterization to 1MHz.



Range of signals supported by the Model 707A and 708A switch/control cards

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The interactive front panels of the Model 707A and 708A allow full configuration of these mainframes during test design and troubleshooting of DUTs. LEDs display the real-time status of all matrix crosspoints. Open or close each crosspoint with a simple point and click of the optional light pen.





Standard Switch Matrix Configurations for I-V and C-V Characterization

GENERAL PURPOSE	LOW CURRENT	ULTRA LOW CURRENT
>100pA Uses Model 7071 switch card	**>1pA Uses Model 7072 switch card**	**<100fA Uses Model 7174A switch card**
• Component ATE • Best match to the 4200-SCS without optional PreAmps • Excellent for remote sense applications • Low cost, high density cables • Expandable from 8 × 12 to 8 × 72	• Basic device characterization • Good match to the 4200-SCS with or without optional PreAmps • Local sense, excellent for C-V meters and pulse generators • Standard triax cables • Expandable from 8 × 12 to 8 × 72	• High performance device characterization • Best match for the 4200-SCS when equipped with optional PreAmps • Local or remote sense, excellent for C-V meters and pulse generators • Standard triax cables • Expandable from 8 × 12 to 8 × 72, local sense • Expandable from 6 × 6 to 6 × 30, remote sense

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RF/microwave switch systems
Standard and custom designs





System 40—the ultimate in hybrid customization

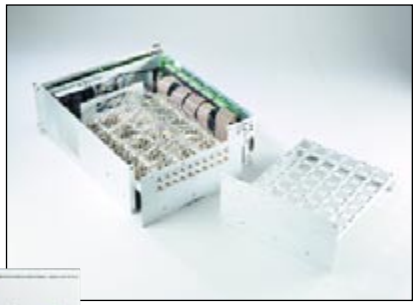
System 40 signal routing solutions are designed and built to match specific application requirements from DC to 40GHz. Create a hybrid switching solution by incorporating RF/microwave, optical, and low frequency switching. Each System 40 is built around a standard Model 7001 or 7002 controller, incorporating local/remote control and continuous real-time display.



- 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.
  - Couplers, dividers, combiners.
  - Amplifiers, splitters, bias tee.



System 41—for superior RF/microwave performance



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 indicators continuously display the status of all channels and crosspoints for easy monitoring during operation.
- Manual and automatic operation of the system speeds and simplifies test verification and troubleshooting.
- Optional light pen allows easy front panel programming.
- Easily accessible RF input/output connections ensure fast and uncomplicated system setup and maintenance.

Standard modules for 18GHz switching include:

- 6×6 non-blocking matrix
- 10×10 non-blocking matrix
- 1×72 multiplexer
- Two individual 1×36 multiplexers
- Custom modules are available

DESIGNED TO SPECIFIC APPLICATION REQUIREMENTS

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for a perfect fit



System 46—designed to exacting specifications

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 multi-pole relays (SP4T to SP6T) in a small 2U high (3.5 inch) full-rack enclosure. Standard solutions can include multiplexers as large as 1×18 and non-blocking matrices as large as 2×6.

- LED indicators continuously display the status of all relay contacts.
- Relay contact closures are counted automatically to determine mechanical contact wear.
- Store characterization data for trending system performance.
- Optional relay kits allow for future expansion or switch replacement.



Model 7116-MWS—standard solution with great performance

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 1×16 or five independent 1×4 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 shows the status of each channel.
- Easy access to RF input/output connections from front panel permits easy maintenance and reconfiguration.



JUST WHAT YOU NEED AND NO MORE

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Low cost switch/measure systems packed with functionality for

TREMENDOUS FUNCTIONALITY IN ONE SMALL PACKAGE

Integra Series switch and measurement systems

An Integra system brings together tremendous functionality in one small package: the ability to perform scans, measurements, switching, and datalogging. The Models 2700 and 2750 are highly integrated systems that offer versatile, yet affordable, solutions to multipoint test, measurement, and control applications. Applications for Integra systems include production testing of electronic products and devices, accelerated stress testing, process monitoring and control, and low ohms, multichannel measurements.

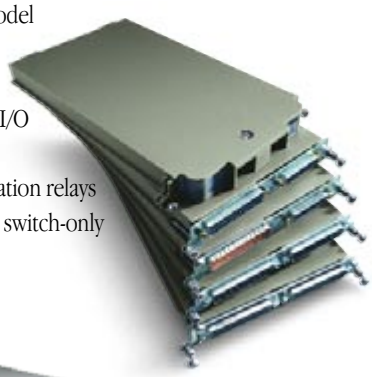


Features:

- Built-in true 6½-digit multimeter. A single integrated system allows performing both measurement and switching tasks more efficiently.
- Automatic thermocouple cold junction compensation. Just connect the thermocouples and start taking readings.
- Traceable, repeatable measurements reduce false failures.
- Outstanding system throughput. Tight coupling of the DMM and switch optimizes system speed and triggering.
- Built-in relay counters monitor the life of relays for easy preventive maintenance.
- Industry standard connectors are used on all plug-in modules for simple wiring and cabling.
- Robust battery backup. If the power goes out, all data is saved. When power returns, the system can resume scanning on its own.
- Free start-up software. Gets applications up and running quickly.

Integra Series switch/control modules

The nine switch/control modules for the Model 2700 and 2750 support a wide range of applications with multiplexer, matrix, independent switch, analog I/O, and digital I/O configurations. Modules can be connected automatically to the internal DMM with isolation relays for full data acquisition capability or used in switch-only mode to provide maximum flexibility.

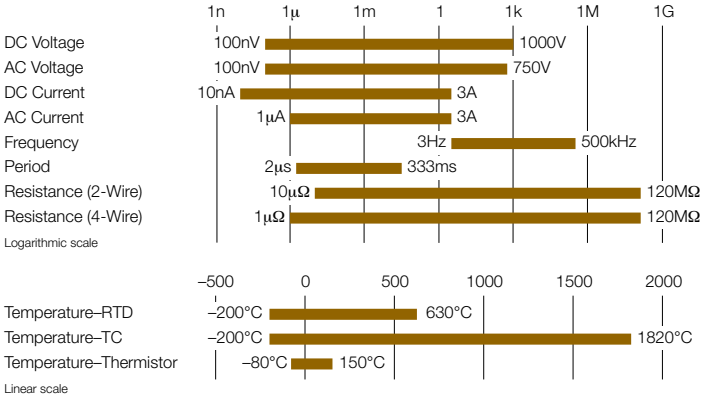




Model 2700/2750 specifications:

- Includes two or five card slots.
- Supports up to 80/200 channels.
- Supports up to 96/240 matrix crosspoints.
- Allows scanning and measuring 185/200 channels/second.
- Performs 2500 readings/second on a single channel.
- Offers true 6½-digit (22-bit) resolution.
- Provides ±1°C thermocouple system accuracy.

Model 2750 Measurement Ranges



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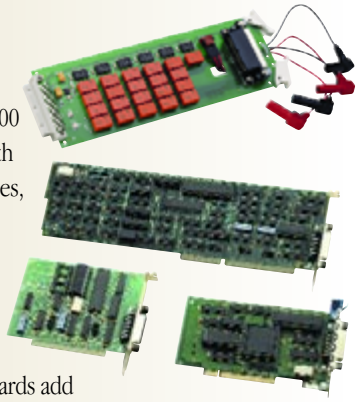
datalogging and production test applications

Accessories

Maximize flexibility, capabilities, and ease of use with these accessories

DMM scanner cards

The Keithley Series 2000 multimeters and the Series 6500 electrometers are available with optional plug-in switch modules, which can provide up to 20 channels of scanning and switching capability.



GPIB boards

Keithley's GPIB (IEEE-488) boards add standard GPIB bus control to a PC. They include complete programming language support for a wide range of languages. Keithley offers GPIB boards for PCs that contain PCI, ISA, and PCMCIA slots.

Digital I/O boards

For applications that require additional digital I/O lines, a wide range of digital I/O boards are available. See the complete list of Keithley digital I/O boards at www.keithley.com.

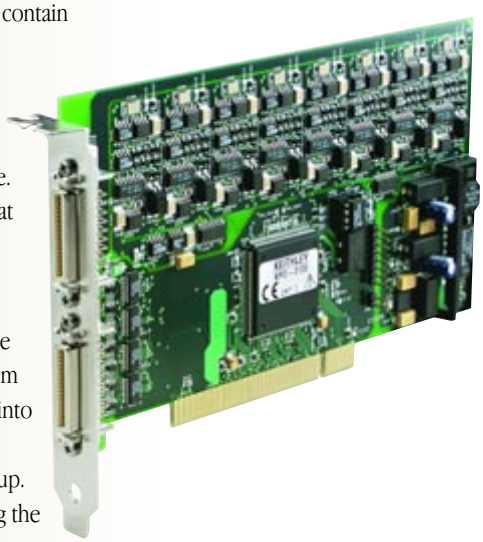
Model KPC-TM Trigger Master

The Trigger Master interface card provides complete timing control over the GPIB instruments in a system without sacrificing throughput. The KPC-TM plugs into the system's PC, giving it direct control over the hardware triggers of the instruments in the test setup. This provides maximum throughput, while allowing the KPC-TM to start and stop a process easily at any time.

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



These products reduce the amount of RF/microwave cabling needed in a system, which increases signal integrity. These stand-alone units are easy to place almost anywhere in the test environment. The Model 7999-4 is a control unit that contains a DC-18GHz SPDT switch. 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.



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Switching Handbook

Request a **FREE** copy of Keithley's Switching Handbook. This reference book describes switching components, topologies, and functions, relay characteristics, and other background information. It also provides selection criteria, system integration hints, guidelines for optimizing test systems, and examples.



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? Keithley's Applications Engineers are experts in their fields (telecommunications, optoelectronics, semiconductors, etc.) and are here to help, before and after the sale.

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.

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 web site for current listings: **www.keithley.com**

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