

SM4000 Series PCI Relay Scanner/Multiplexer

■ **SM4020**
20 Channel

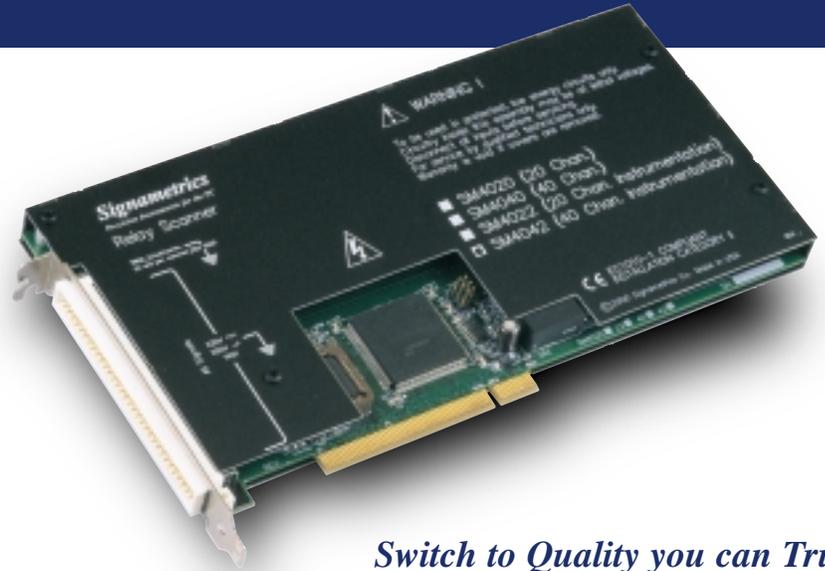
■ **SM4022**
20 Channel,
Instrumentation

■ **SM4040**
40 Channel

■ **SM4042**
40 Channel
Instrumentation

SM4000 Series Features

- ◆ Up to 4 differential 10:1 scan groups
- ◆ Software Configurable for
 - 2-wire measurements
 - 4-wire measurements
 - 6-wire measurements
 - Universal
- ◆ Fast switching and settling times
- ◆ Low thermal EMF offset
- ◆ Low Leakage
- ◆ Low capacitance
- ◆ Measure relay actuation time
- ◆ Test for contact failure
- ◆ On board Micro-Controller for maximum flexibility
- ◆ Auto-Scanning mode
- ◆ Trigger input and output
- ◆ Triggered Scanning operation
- ◆ Power and Control Isolation
- ◆ Self Cleaning
- ◆ Channel I.D.
- ◆ Programmable actuation and delay times

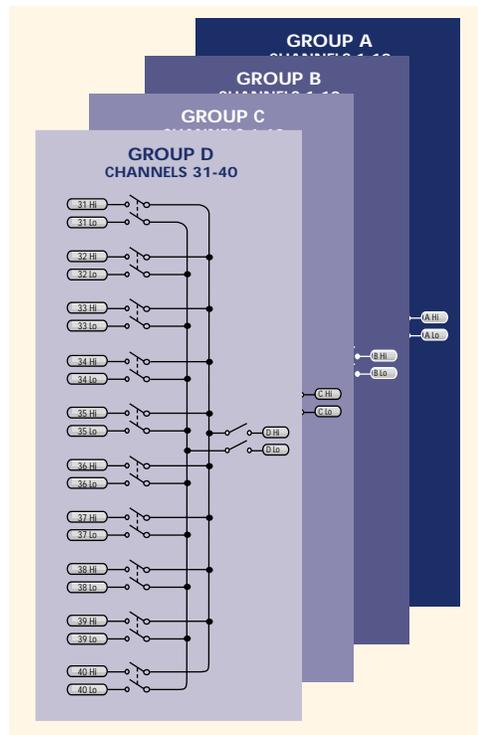


Switch to Quality you can Trust

Uncompromising Performance

The SM4000 family of start-of-the-art, high density relay scanners/multiplexers are designed to compliment Signametrics' line of high-end DMMs with suitable precision switching capabilities. Utilizing an on-board Micro-controller, the SM4000 series is an intelligent switching product, particularly suitable for demanding test applications. The SM4000 can be configured on-the-fly to handle 2, 4 and 6 wire guarded measurements. The very low thermal-offset, leakage and capacitance make the SM4000 ideal for switching precise signals, and unlike currently available products, it will not degrade measurements. To top the SM4000 series superior functionality and switching performance, it features an unparalleled built-in self-test capability that checks for actuation time, contact bounce and contact failure.

SM4000 Series Architecture



The SM4000 series employs up to 4 differential switching groups of 10:1. Each group features a "Tree Relay" that isolates a group when not in use. The "Tree Relay" architecture minimizes the overall capacitance and leakage as seen by the stimuli or measurement instruments, or additional scanner. Relays are also provided for inter-group configuration which can be set on-the-fly and allow for the various modes of operation.

The SM4040 and SM4042 can be programmed to the following configurations:

- ◆ A single 40:1 scanning group
- ◆ Dual scanning groups of 20:1 each
- ◆ Four scanning groups of 10:1 each
- ◆ Any combination of the above

To maximize the SM4000 series versatility, the user can access and control any relay at any time including multiple relays within the same group.

Galvanic Isolated Architecture

The SM4042 and the SM4022 feature a high voltage galvanic isolation. A high voltage isolation DC/DC power supply and an optically isolated high-speed communication channel form a barrier between the scanner and the PC. The benefit is a floating, guarded switching system, with very low conductive and capacitive noise coupling, as well as a very low leakage to the PC chassis. Ground-loops typically associated with the PC Chassis and power supplies are also eliminated.

Isolated Relays

To further minimize the noise coupling and capacitance, the SM4000 series utilizes isolated and guarded relay contacts and coil drive. Isothermal construction guarantees low thermal EMF offset which is crucial when performing precise resistance, voltage, current, temperature and many other sensitive measurements. Compare this specification with other plug-in relay scanners, which are not specified for thermal EMF, and commonly exhibit offsets higher than a hundred micro volts.

Shielded Construction

Shielded construction contributes in several ways. A guard shield reduces RFI/EMI emissions and susceptibility. Combined with the floating architecture, noise coupling into the switching system is greatly reduced. In addition, the covers improve the isothermal properties of the unit, and provides safety to the user by preventing accidental contact with the potentially lethal voltages.

On Board Intelligence

The SM4000 series employs an on-board Microcontroller, allowing the scanner to run autonomously from the PC, and execute complex operations in response to high level commands. In addition to improving product control it also guarantees repeatable switching performance. The user has full control of the scanner and communicates with it using a set of simple high level commands. Even-though the SM4000 series allows the user full control to implement any switchable combination, the Microcontroller's pre-defined operation modes (when set) protect the scanner from inadvertently performing prohibited and potentially damaging commands such as shorting several active inputs together.

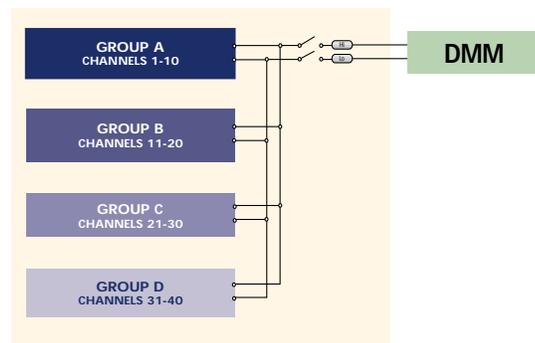
Configuration Examples

The SM4000 Relay Scanners may be configured to several pre-defined modes of operation. The following examples represent some common applications.

The flexible configuration is facilitated by several inter-group and tree relays. The tree-relays, are designed to minimize leakage

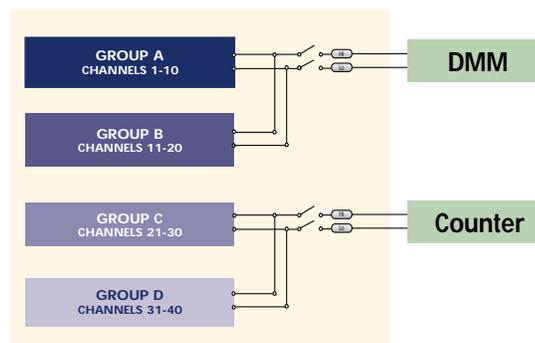
and capacitance by isolating the group's 10 channel relays from the rest of the switching system. This is particularly important with switching systems consisting of multiple scanners. Also, when a single scanner is shared between two or more instruments, the tree-relays provide the necessary isolation while one instrument is accessing a channel in

Single Instrument - 2-Wire measurements



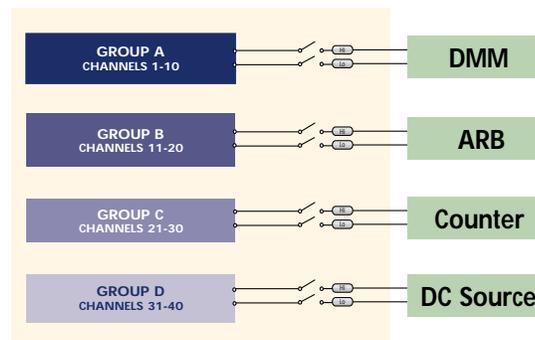
In the *2-Wire* configuration, each of the 40 measurement channels of an SM404x may be routed to the DMM. The DMM is physically connected to Group A-bus. While in TwoWire configuration, accessing higher channels, in groups B,C or D, the inter-group relays are automatically engaged to connect the appropriate group to the A-bus.

Dual Instruments - 2-Group configuration



In the *2-group* configuration, two instruments share the SM404x scanning capacity, each accessing 20 channels (20:1) independently. Both instruments have access to all 40 channels. Selecting channels 21 to 40 by the DMM may require isolating the counter by disengaging group C tree-relay. Setting the scanner to a *2-Group* configuration will allow the autonomous channel selection by the two instruments.

Multiple Instruments - 4-Groups configuration



While in the *4-Groups* configuration, up to four instruments may be connected to a single SM404x. Each instrument can access channels within its respective group. Alternatively, if set to the Universal configuration, each of the instruments may access any of the 40 channels, as well as have multiple instruments connected to the same channel at the same time.

Scan List Operation

With a pre-stored switching sequence in the on-board Scan List, any channel sequencing at any order can be programmed. The Scan List is also designed to accommodate multiple relay scanners, for high channel count. Up to 192 points can be stored in the scan sequence, which may include channels from multiple scanner modules. The maximum number of channels is limited to 1,000.

Trig Scan Mode

In this mode the SM4000 series scanner is slaved to an external device which provides hardware or software trigger causing the SM4000 to step through the Scan List table. Each trigger will advance the scanner to the next point in the table. As with all other scanning operations, Relay's Settling time can be set.

Auto Scan Mode

In response to a single software command, the SM4000 will execute a scan sequence based on the contents of the Scan List. While stepping through the Scan List table, the scanner generates Trigger signal at each step. This signal can be used to synchronize a DMM or other test and measurement instrument. Both the relays actuation and step times can be preset.

Contact Self Cleaning

The SM4000 series uses a special on-board stimulus source for quick relay contact cleaning. It can be used periodically with the test connector in place, to clean all relay contacts from oxides and other deposits and contaminates which accumulate over time.

Build-In Self Test

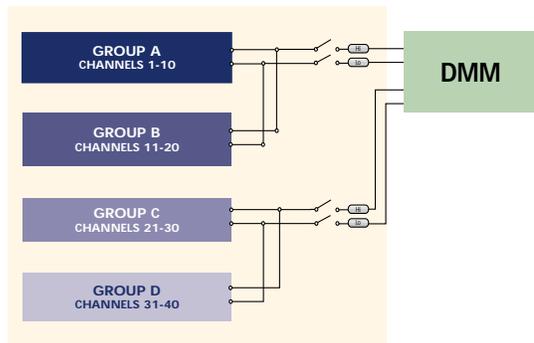
The SM4000 built-in self-test functions feature measurement of relay actuation time, including bounce, excessive bounce test, and contact open and short failures. This tool provides an invaluable verification and confidence of knowing that the scanner is up to its performance specifications. The measurement of actuation time can also be used to optimize the scanner speed.

the other scan group. For example: with a DMM connected to group A-bus and a Counter to group C-bus, isolating the counter allows the DMM to access channels 21 to 40 without interference from the counter.

The inter-group relays provide the means to connect various scan groups to each other. With the tree-relays, these relays are involved in the configuration of the scanner to its various operating modes such as 2-wire, 4-wire, 6-wire, 2-groups, Universal mode etc.

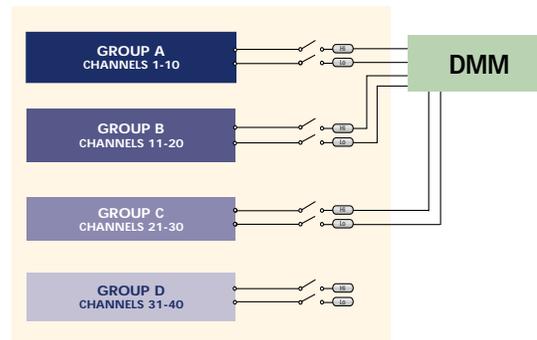
Single Instrument - 4-Wire Measurement:

In the 4-Wire configuration, the SM404x can route 20 4-wire channels. The DMM source pair is connected to the A-bus (for groups A, B access) and the sense pair is connected to the C-bus (for groups C, D access). For example, responding to 'Select Channel 2' command, the scanner opens all closed channel relays, followed by closing of Ch2 and Ch22 relays.



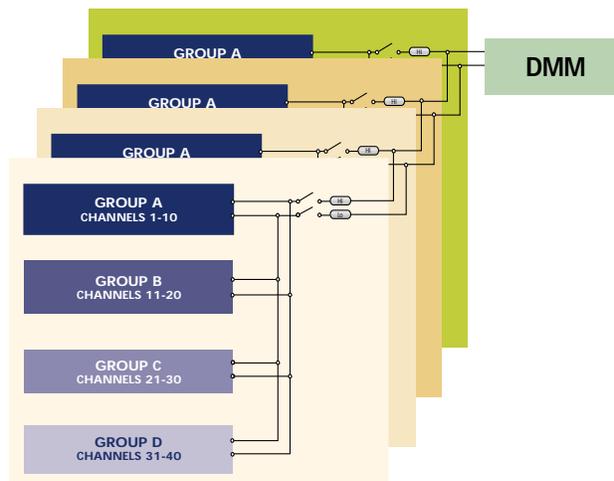
Single Instrument - 6-Wire Measurement:

When combined with the SM2044, the SM404x can provide a 6-Wire guarded measurement system, by selecting SixWire configuration. Issuing 'Select Channel 2' results in the opening of all closed channel relays, followed by closing of Ch2, Ch12 and Ch22 relays. This system is limited to 10 channels of six wire inputs. Additional scanners can expand it up-to 1,000 channels.



Multiple Scanners

Multiple Scanners can be deployed to form over 1000 channels. The "Tree-Relay" ensure minimum noise pickup, capacitance and leakage as seen by the instrument connected to the common bus.



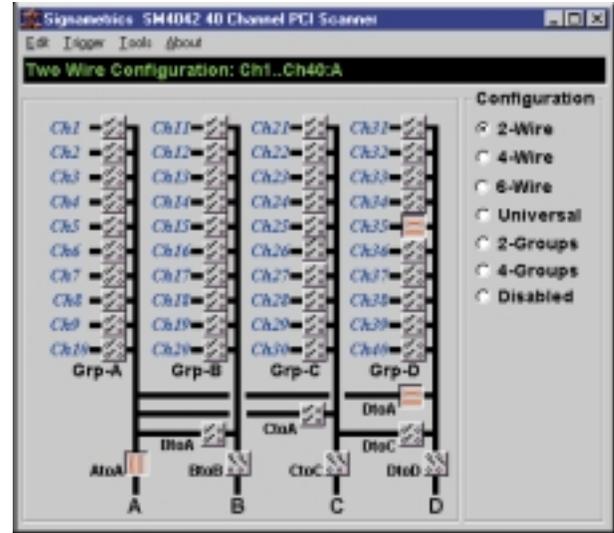
Company Background

The Signametrics design team has many years of experience designing brand name bench top instruments. That experience has resulted in a family of PC instruments that maintain accuracy and performance even in the PC's electrically noisy environment. Signametrics instruments are designed to sustain, without damage, the inevitable over voltage events. Attention to reliability in the design phase resulted in instruments that demonstrate over 1,000,000 hours MTBF in operation.

Programming

The SM4000 series supports Plug-and-Play operating systems. Once installed, your computer will automatically recognize and allocate I/O space. With an easy-to-learn, intuitive Graphical User Interface, the scanner is up and running within minutes of installation. As with all MS-Windows based programs, just point and click to perform a wide range of scanning functions.

To further increase productivity and to automate the measurement process, the SM4000 series is provided with a 32 bit DLL allowing users to easily customize drivers for controlling programs. Programming examples for most popular textual and graphical programming environments are provided. The S/W is compatible with Windows 98/95 NT and 2000.



Specifications

	SM4020	SM4022	SM4040	SM4042
Number of Channels	20		40	
Arrangement	Two groups of 10:1		Four groups of 10:1	
Max Switching Voltage	110VDC/AC	220VDC/250VAC	110VDC/AC	220VDC/250VAC
Max Carrying / Switching Current	1A	1A	1A	1A
Thermal EMF	<25 μ V	<1.5 μ V	<25 μ V	<1.5 μ V
Inter Channel Capacitance		<10pF		<10pF
Insulation between open contacts	>100 M Ω	>1,000 M Ω	>100 M Ω	>1,000 M Ω
No Load Life	2x10 ⁷	10 ⁸	2x10 ⁷	10 ⁸
Load Life @ 50Vdc, 100mA	3x10 ⁵	10 ⁶	3x10 ⁵	10 ⁶
Typical Closure time	12ms	4ms	12ms	4ms
Typical Release time	5ms	2ms	5ms	2ms
Actuation Time [1]	15ms	5ms	15ms	5ms
Possible Configuration	2, 4-Wire Universal, Mixed	2, 4-Wire Universal, Mixed	2, 4, 6-Wire Universal, Mixed	2, 4, 6-Wire Universal, Mixed
Actuation Delay Programming	1ms - 850 ms			
Autoscan Period Programming	1ms - 850 ms			
Available Groups	A and B	A and B	A, B, C and D	A, B, C and D
Isolated Architecture	No	Yes	No	Yes
Dimensions	4.5" x 9.1"			
Weight	400g			
Power Consumption	+ 5V supply < 3W typical			

[1] Includes Break before make switching and contact bounce time.

Warranty

Signametrics products are warranted for a period of one years from date of delivery against defects in material and workmanship. Returned products will either be repaired or replaced at Signametrics' discretion. Excluding relays wear.

Signametrics

Precision Instruments for the PC

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