- Dual or Quad Channel Resistor Card
- Fitted with Electromechanical Relays
- Short and Open Simulation
- Simple Software Control Through Resistance Calls
- Provides Fully Isolated Variable Resistors
- Option of Added SPDT Uncommitted Relays
- Special Versions With Non Standard Resistors Built To Order
- VISA & Kernel Drivers Supplied for Windows Plus Soft Front Panel
- 3 Year Warranty
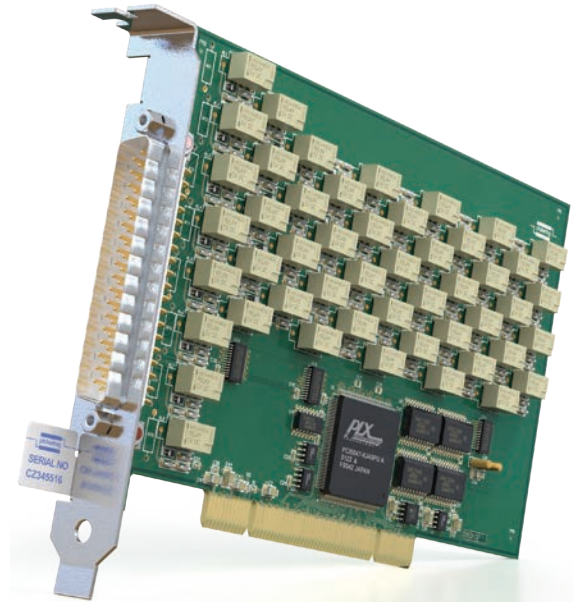
The 50-293 is a programmable resistor with either two or four resistor channels in a single slot short PCI format card. The card is ideal for simulating sensors in control systems under test, allowing the user to verify responses in design verification or manufacturing test applications.

The 50-293 can be supplied with 8xSPDT electro-mechanical relays providing a resistor card and a relay card in a single PCI slot. These uncommitted relays have a number of uses, including extending the resistor channels or adding additional fault conditions. Each relay includes a footprint for the user to fit an axial lead resistor which can be switched in and out of circuit by the relay.

Software control of the 50-293 is simplified by the use of resistor value calls. The card calculates the channel setting closest to the requested value and sets that value.

The user can interrogate the card to find the actual setting. Alternatively, users can operate individual relays within the resistor chains by setting the appropriate bit pattern.

Versions with other resistance values can be provided for specific applications. This includes the fitting an offset resistor that can be used to set the minimum resistance value. If versions are required with different resistance ranges than those shown, please contact the Pickering Interfaces' Sales Office for assistance.

For improved accuracy each resistor channel has calibration data stored on the card. The card is supplied with VISA drivers and a soft front panel.
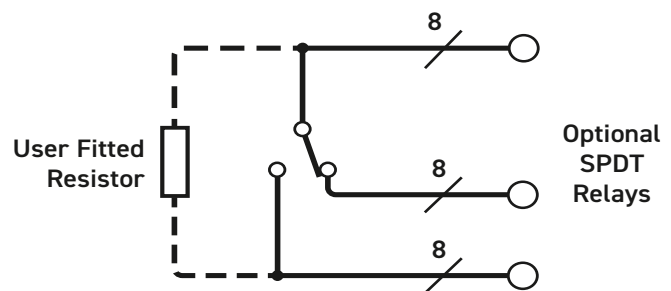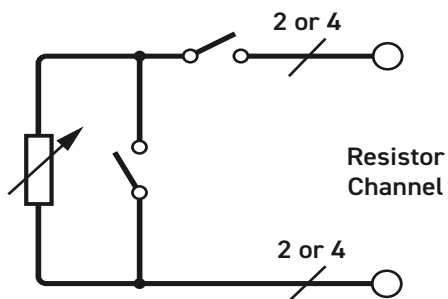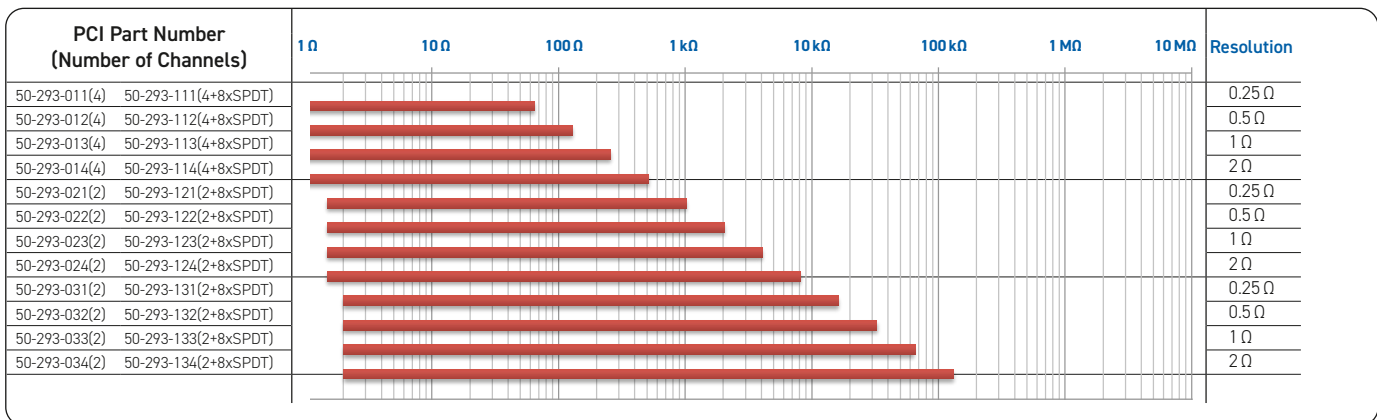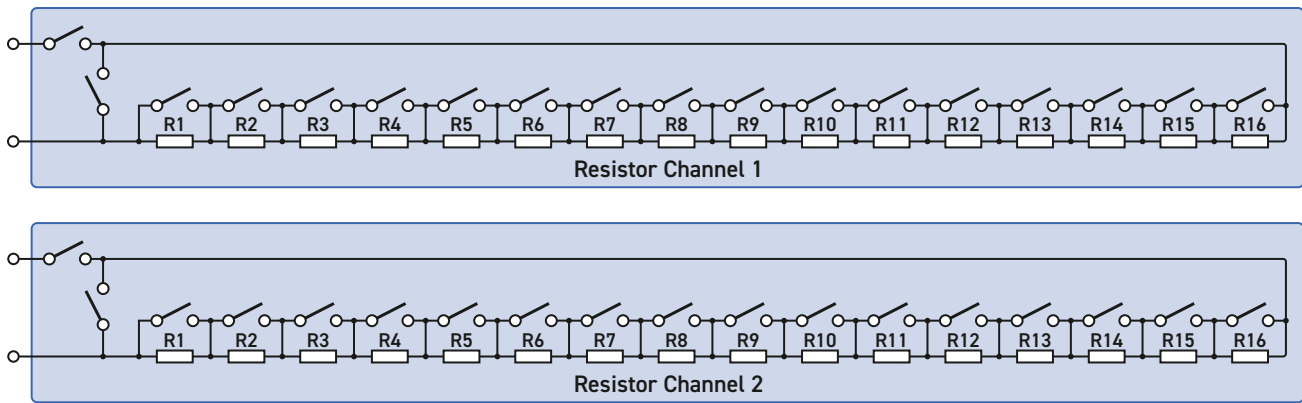

Functional Diagram for the 50-293 Programmable Resistor & Relay Card
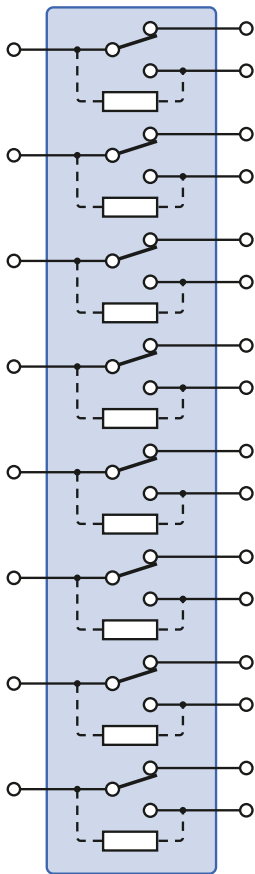
The 50-293 is part of a range of PCI Resistor Cards:

Pickering's Range of PCI Resistor Cards			
Model No.	Description	Channels	Range
50-293	Programmable Resistor + SPDT	2 or 4	Up to 131 kΩ
50-294	Programmable Resistor + SPST	2 or 4	Up to 131 kΩ
50-295A	Programmable Resistor	3, 6, 5, 10 or 18	Up to 16 MΩ
50-296A	Programmable Potentiometer	1, 2, 3, 4, 5 or 9	Up to 16 MΩ
Precision Resistor Cards			
For applications requiring greater resolution (to <2 mΩ) or better accuracy (to <0.03 %), see our Precision Resistor range which includes models 50-262, 50-265, and 50-297			
Custom Resistor Cards			
If our range of resistor cards does not meet your requirements, please contact the sales office to discuss your application. Customizations include: different start and stop values, current, power, voltage, precision, accuracy, number of channels, connector etc.			

Graphical Representation of the 50-293 Resistor Card Range

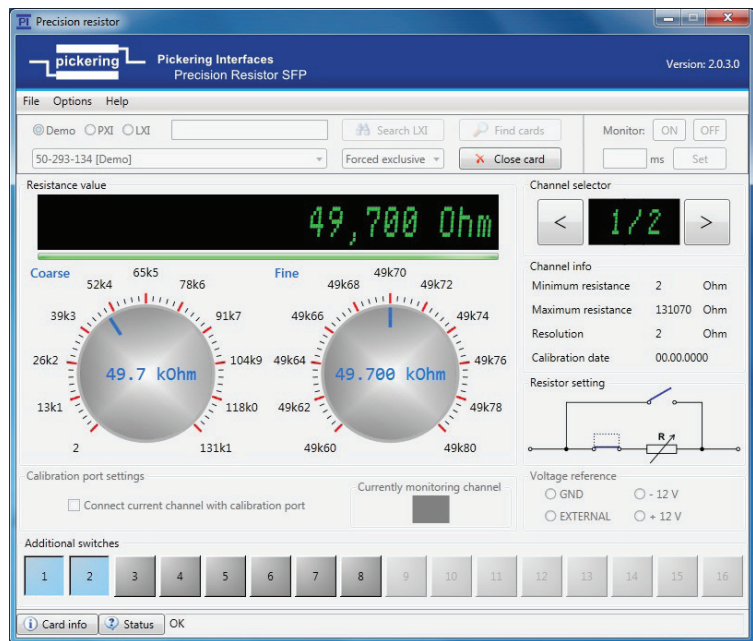| PCI Part Number (Number of Channels)		Resolution
50-293-011(4)	50-293-111(4+8xSPDT)	0.25 Ω
50-293-012(4)	50-293-112(4+8xSPDT)	0.5 Ω
50-293-013(4)	50-293-113(4+8xSPDT)	1 Ω
50-293-014(4)	50-293-114(4+8xSPDT)	2 Ω
50-293-021(2)	50-293-121(2+8xSPDT)	0.25 Ω
50-293-022(2)	50-293-122(2+8xSPDT)	0.5 Ω
50-293-023(2)	50-293-123(2+8xSPDT)	1 Ω
50-293-024(2)	50-293-124(2+8xSPDT)	2 Ω
50-293-031(2)	50-293-131(2+8xSPDT)	0.25 Ω
50-293-032(2)	50-293-132(2+8xSPDT)	0.5 Ω
50-293-033(2)	50-293-133(2+8xSPDT)	1 Ω
50-293-034(2)	50-293-134(2+8xSPDT)	2 Ω

Schematic for 50-293-x3x Resistor Card

8 x SPDT Relay Option

Example Soft Front Panel for the Resistor Card

Relay Type

The 50-293 is fitted with electro-mechanical relays with Palladium-Ruthenium Gold covered contacts. A Spare Relay is built onto the circuit board to allow easy maintenance with minimum downtime.

Programmable Resistor Specification

Accuracy of Resistance Call:	±1 % ±Resolution †
Accuracy of Resistance Readback:	±0.3 % ±0.1 Ω †
Max Switch Voltage:	100 V*
Max Power:	0.5 W
Residual Resistance, typical (when chain resistance is set to 0 Ω):	1 Ω (50-293-x1x) 1.5 Ω (50-293-x2x) 2 Ω (50-293-x3x)
Operate Time:	3 ms ‡
Expected Life, Low power load: Expected Life, Full power load:	>1x10^8 operations >1x10^5 operations

* For full voltage rating, signal sources must be fully isolated from mains supply and safety earth.

† Valid between ±10 °C from calibration temperature (factory calibrated at 21 °C).

‡ The total operate time when setting a resistance may be longer depending upon the change requested due to relay sequencing.

Power Requirements

+3.3 V	+5 V	+12 V	-12 V
0.25 A	0.25 A	0	0

Mechanical Characteristics

Single slot short PCI format.

3D models for all versions in a variety of popular file formats are available on request.

Connectors

Resistor connections via a 37-pin male D-Type connector. For pin outs please refer to the operating manual.

Uncommitted SPDT Relay Specification

Switch Type:	Electro-mechanical
Contact Type:	Palladium-Ruthenium, Gold Covered Bifurcated
Max Switch Voltage:	100 VDC
Max Power:	60 W/62.5 VA
Max Switch Current:	2 A
Max Continuous Carry Current:	2 A
Max Pulsed Carry Current Example (for single switch path):	6 A for 100 ms (up to 10 % duty cycle)
Initial Path Resistance, On:	0.2 Ω
Path Resistance, Off:	>10^9 Ω
Minimum Voltage:	100 µV
Operate Time:	3 ms
Expected Life (operations) Very low power signal load: Low power load (2 W): Medium power load (30 W): Full power load (60 W):	>10^8 >1.5x10^7 (0.1 A 20 VDC) >5x10^6 (1 A, 30 VDC) >1x10^5 (2 A, 30 VDC)

* For full voltage rating, signal sources must be fully isolated from mains supply and safety earth.

Note: When user defined resistors are fitted to SPDT relays, the above ratings may be affected, refer to fitted resistor ratings.

Operating/Storage Conditions

Operating Temperature:	0 °C to +55 °C
Humidity:	Up to 90 % non-condensing
Altitude:	5000 m

Storage Temperature:	-20 °C to +75 °C
Humidity:	Up to 90 % non-condensing
Altitude:	15000 m

Safety & CE Compliance

All cards are fully CE compliant and meet applicable EU directives:

Low-voltage safety EN61010-1:2010,
EMC Immunity EN61326-1:2013,
Emissions EN55011:2009+A1:2010.

PCI Compliance

The 50-293 complies with the PCI Specification 2.0 (issued Feb 2004).

Signalling Environment: 33 MHz, 32-bit Universal (+3.3 V or +5 V).

For advance information about a PCI Express version of this card please contact your local Pickering sales office

Supplied soft front panels and driver software are fully compatible with Windows operating systems.

Product Order Codes

0.25 Ω Resolution

Range	No. of Channels	Order Code, No SPDT Relays	Order Code, With SPDT Relays
1 Ω to 63.7 Ω	4	50-293-011	50-293-111
1.5 Ω to 1.02 kΩ	2	50-293-021	50-293-121
2 Ω to 16.3 kΩ	2	50-293-031	50-293-131

0.5 Ω Resolution

Range	No. of Channels	Order Code, No SPDT Relays	Order Code, With SPDT Relays
1 Ω to 127 Ω	4	50-293-012	50-293-112
1.5 Ω to 2.04 kΩ	2	50-293-022	50-293-122
2 Ω to 32.7 kΩ	2	50-293-032	50-293-132

1 Ω Resolution

Range	No. of Channels	Order Code, No SPDT Relays	Order Code, With SPDT Relays
1 Ω to 255 Ω	4	50-293-013	50-293-113
1.5 Ω to 4.09 kΩ	2	50-293-023	50-293-123
2 Ω to 65.5 kΩ	2	50-293-033	50-293-133

2 Ω Resolution

Range	No. of Channels	Order Code, No SPDT Relays	Order Code, With SPDT Relays
1 Ω to 510 Ω	4	50-293-014	50-293-114
1.5 Ω to 8.19 kΩ	2	50-293-024	50-293-124
2 Ω to 131 kΩ	2	50-293-034	50-293-134

Accessories:

Calibration lead for 4-wire resistance measurement of the Programmable Resistor Channels using DMM - 37-pin D-type socket to shrouded 4mm bayonet plugs,

1 m length: 40-975-037-02-1m

Product Customization

Pickering PCI cards are designed and manufactured on our own flexible manufacturing lines, giving complete product control and enabling simple customization to meet very specific requirements.

All customized products are given a unique part number, fully documented and may be ordered at any time in the future. Please contact your local sales office to discuss.

Mating Connectors & Cabling

For connection accessories for the 50-293 please refer to the 90-007D 37-pin D-type Connector Accessories data sheet where a complete list and documentation can be found for accessories.

Pickering can supply mating connectors and cable assemblies to enable easy integration of the 50-293 series of PCI cards

Other Resistor Cards

Pickering Interfaces manufacture a range of variable resistor cards in the PCI format. If you have a requirement for a variable resistor card please contact your local sales office with the information below and we will advise you on the best solution for your application.

Lowest Resistance †	
Highest Resistance	
Resistance Resolution	
Overall Accuracy	
Maximum Power/Current	
Number of Channels (variable resistors)	

† Resistance is as measured across the user connector terminals, minimum resistance must have a non-zero value.
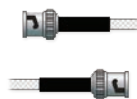
Connectivity Solutions

We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with **1200+** products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed to mechanically and electrically mate to our modules. These accessories are detailed in Connector Accessories data sheets, where a complete list and documentation can be found for each accessory.

| Connectors & Backshells	Multi-way Cable Assemblies	RF Cable Assemblies	Breakouts	Connector Blocks

We also offer customized cabling and have a free online **Cable Design Tool** that can be used to create custom cable solutions for many applications.

- Fully supported on modern browsers and tablet operating systems.
- Built-in tutorials and videos allow you to get quickly up to speed.
- Store cable assemblies in the Cloud and develop over time.
- Each cable design has a downloadable PDF documentation file detailing all specifications
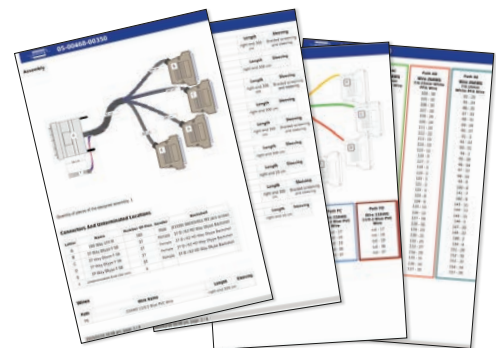
Start designing your custom cabling, go to pickeringtest.com/cdt

Mass Interconnect

We recommend the use of a mass interconnect solution when an Interchangeable Test Adapter (ITA) is required for PXI/LXI based test systems. Our modules are fully supported by Virginia Panel and MacPanel.

Pickering Reed Relays

We are the only switch provider with in-house reed relay manufacturing capability via our Relay Division. These instrument grade reed relays feature *SoftCenter*™ technology, ensuring long service life and repeatable contact performance.

To learn more go to pickeringrelay.com
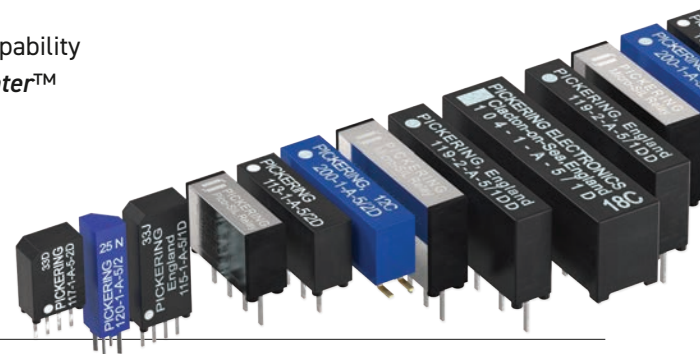
Programming

Pickering provide kernel, IVI and VISA (NI & Keysight) drivers which are compatible with all Microsoft supported versions of Windows and popular older versions.

For more information go to pickeringtest.com/os

The VISA driver support is provided for LabVIEW Real Time Operating Systems (Pharlap and Linux-RT). For other RTOS support contact Pickering. These drivers may be used with a variety of programming environments and applications including:

- **Pickering Interfaces Switch Path Manager**
- **National Instruments** products (LabVIEW, LabWindows/CVI, Switch Executive, MAX, TestStand, VeriStand, etc.)
- **Microsoft Visual Studio** products (Visual Basic, Visual C++)
- **Programming Languages** C, C++, C#, Python
- **Keysight** VEE and OpenTAP
- **Mathworks MATLAB, Simulink**
- **Marvin** ATEasy
- **MTQ Testsolutions** Tecap Test & Measurement Suite

Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help you develop test routines with ease.

To learn more about software drivers and development environments go to pickeringtest.com/software

Signal Routing Software

Our signal routing software, Switch Path Manager, automatically selects and energizes switch paths through Pickering switching systems. Signal routing is performed by simply defining test system endpoints to be connected together, greatly accelerating Test System software development.

To learn more go to pickeringtest.com/spm
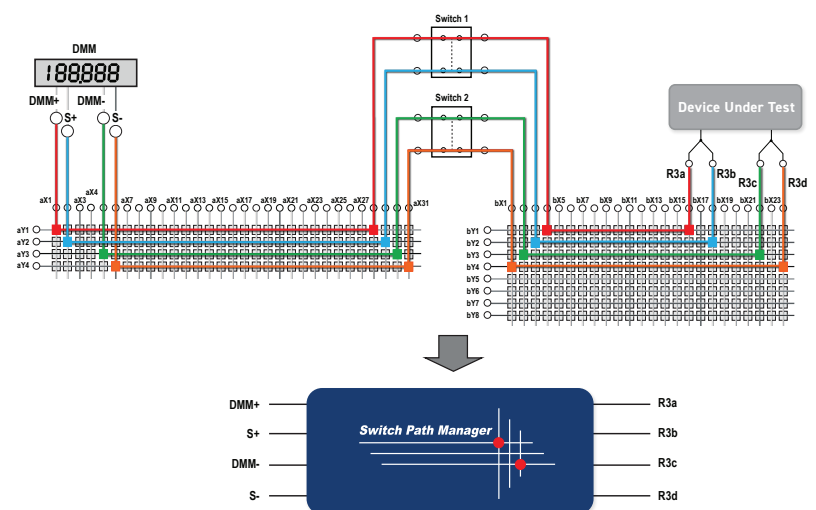
Diagnostic Relay Test Tools

eBIRST Switching System Test Tools are designed specifically for our PXI, PCI or LXI products, these tools simplify switching system fault-finding by quickly testing the system and graphically identifying the faulty relay.

To learn more go to pickeringtest.com/ebirst

Three Year Warranty & Guaranteed Long-Term Support

All standard products manufactured by Pickering Interfaces are warranted against defective materials and workmanship for three years from the date of delivery to the original purchaser. Extended warranty and service agreements are available with various levels for your requirements. Although we offer a 3-year warranty as standard, we also include guaranteed long-term support—with a history of supporting our products for typically 15-20 years.

To learn more go to pickeringtest.com/support

Available Product Resources

We have a library of resources including success stories, product and support videos, articles and white papers as well as application-specific brochures to assist you. We have also published reference books on switching technology and the PXI and LXI standards.

To view, download or request any of our product resources go to pickeringtest.com/resources