- Dual 16-Bit or Quad 8-Bit Resolution Resistor Module
- Programmable From $0\,\Omega$ to $32767.5\,\Omega$ in $0.5\,\Omega$ Steps
- Built-In Non-Volatile Parametric Memory For Calibration Data
- Option To Include 16 SPDT Reed Relays
- Uses High Reliability Pickering Reed Relays For Maximum Performance
- Over 1000 Value Changes Per Second
- Special Versions Built To Order
- VISA, IVI & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- 3 Year Warranty

The 40-290 Programmable Resistor Module comprises a dual 16-bit resistor chain together with 16 optional SPDT Reed Relays (see diagram below). The 40-291 is configured as a quad 8-bit programmable resistor chain also with the option of 16 SPDT relays. Connections are made via a front panel 68-pin male connector.

Programmable resistors may be connected together either in series or in parallel to form many types of configuration. For example potentiometers (2 resistors in series) and more accurate resistors (connecting in parallel). Each programmable resistor has a position for a user inserted offset value.

The 40-290 and 40-291 use Ruthenium Reed Relays for maximum switching accuracy and operating life.

To give maximum accuracy each resistor chain has on-board E^{2}PROM, this allows accurate calibration data to be recorded for each resistor in the chain.

If versions are required with different resistor ranges than those shown, please contact the Sales Office for assistance.
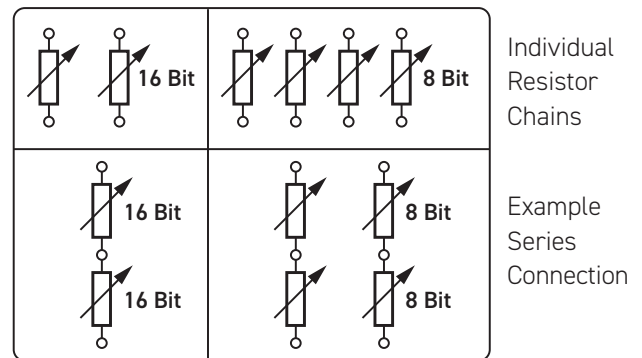
Programmable Resistor Module Overview
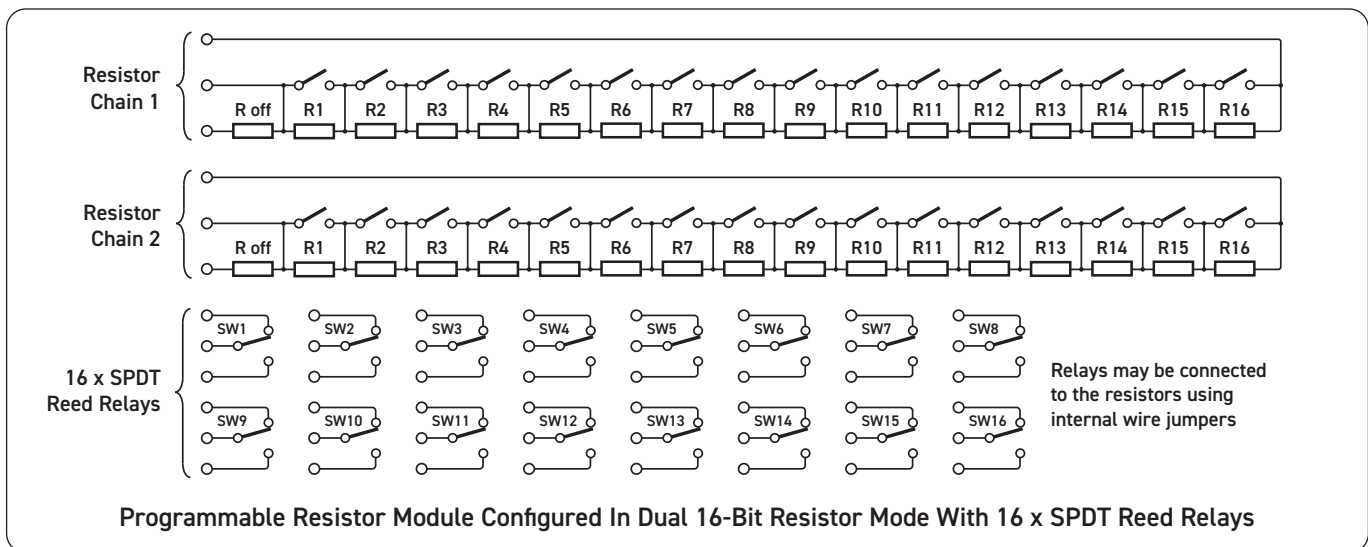
Programmable Resistor Module Configured In Dual 16-Bit Resistor Mode With 16 x SPDT Reed Relays

pickering   pickeringtest.com

Relay Type

The 40-290 & 40-291 are fitted with ruthenium sputtered reed relays offering very long life with good low level switching performance and excellent contact resistance stability. Spare reed relays are built onto the circuit board to allow easy maintenance with minimum downtime.

All reed relays are manufactured by our Relay Division: pickeringrelay.com

Programmable Resistor Specification

Max Switch Voltage:	100 V*
Resolution:	0.5 Ω
† Accuracy of Fitted Resistor:	0.5 %
Residual Resistance, typical (when chain is set to 0Ω):	1 Ω (8-bit)
	2 Ω (16-bit)
Max Power: 0.5 to 10 Ω	1 W
10 to 100 Ω	0.5 W
100 Ω+	0.25 W
Operate Time:	<0.5 ms
Release Time:	<0.5 ms
Expected Life, Low power load:	>1x10^{8} operations
Expected Life, Full power load:	>1x10^{6} operations

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

† Overall accuracy of module is a combination of the fitted resistor accuracy and the relay/track resistance that makes up the residual path resistance.

Switching Specification (16 x SPDT Reed Relays)

Switch Type:	Ruthenium Reed
Max Standoff Voltage:	100 V*
Max Power:	3 W
Max Switch Current:	0.25 A
Max Carry Current:	0.5 A
Initial Path Resistance, On:	<400 mΩ
Path Resistance, Off:	>1x10^{9} Ω
Operate Time:	<0.5 ms
Release Time:	<0.5 ms
Expected Life, Low power load:	>1x10^{8} operations
Expected Life, Full power load:	>1x10^{6} operations

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

Power Requirements

+3.3 V	+5 V	+12 V	-12 V
0	740 mA (typ 400 mA)	0	0

Mechanical Characteristics

Single slot 3U PXI (CompactPCI card).
3D models for all versions in a variety of popular file formats are available on request.

Connectors

PXI bus via 32-bit P1/J1 backplane connector. Resistor channel signals via front panel 68-pin female micro-D connector. Each resistor has 4 wire connections (Kelvin) so allowing elimination of wires and connectors in high accuracy measurements.

Operating/Storage Conditions

Operating Conditions

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

Storage and Transport Conditions

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

PXI & CompactPCI Compliance

The module is compliant with the PXI Specification 2.2. Local Bus, Trigger Bus & Star Trigger are not implemented.

Uses a 33 MHz 32-bit backplane interface.

Safety & CE Compliance

All modules 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.
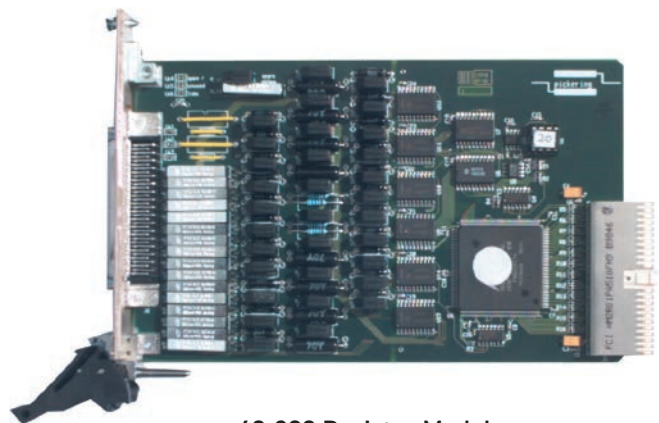
40-290 Resistor Module

Product Order Codes

Dual 16-Bit Resistor Module	**40-290-021**

(resistor value is 0 Ω to 32,767.5 Ω excluding residual resistance)

Dual 16-Bit Resistor Module + 16 x SPDT Relays	**40-290-121**

(resistor value is 0 Ω to 32,767.5 Ω excluding residual resistance)

Quad 8-Bit Resistor Module	**40-291-021**

(resistor value is 0 Ω to 127.5 Ω excluding residual resistance)

Quad 8-Bit Resistor Module + 16 x SPDT Relays	**40-291-121**

(resistor value is 0 Ω to 127.5 Ω excluding residual resistance)

Mating Connectors & Cabling

For connection accessories for the 40-290 series please refer to the 90-015D 68-pin micro-D Connector Accessories data sheet where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.

Other Resistor Modules

Pickering Interfaces manufacture a range of variable resistor modules in the PXI format. If you have a requirement for a variable resistor module 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.

Product Customization

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

Customization can include:

- Alternative resistance range
- Alternative resolution
- Different number of channels
- Different performance specifications

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.

Chassis Compatibility

This PXI module must be used in a suitable chassis. It is compatible with the following chassis types:

- All chassis conforming to the 3U PXI and 3U Compact PCI (cPCI) specification
- Legacy and Hybrid Peripheral slots in a 3U PXI Express (PXIe) chassis
- Pickering Interfaces LXI or LXI/USB Modular Chassis

Chassis Selection Guide

Standard PXI or hybrid PXIe Chassis from any Vendor:

- Mix our 1000+ PXI switching & simulation modules with any vendor's PXI instrumentation
- Embedded or remote Windows PC control
- Real-time Operating System Support
- High data bandwidths, especially with PXI Express
- Integrated module timing and synchronization

Pickering LXI or LXI/USB Modular Chassis—only accept our 1000+ PXI Switching & Simulation Modules:

- Ethernet or USB control enables remote operation
- Low-cost control from practically any controller
- LXI provides manual control via Web browsers
- Driverless software support
- Power sequencing immunity
- Ethernet provides chassis/controller voltage isolation
- Independence from Windows operating system

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.

Connectors & Backshells   **Multiway Cable Assemblies**   **RF Cable Assemblies**   **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. Visit: pickeringtest.com/cdt to start your design.

Mass Interconnect

We recommend the use of a mass interconnect solution when an Interchangeable Test Adapter (ITA) is required for a PXI or LXI based test system. Our modules are fully supported by both 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, please 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 a list of all supporting operating systems, please see: pickeringtest.com/os

The VISA driver is also compatible with Real-Time Operating Systems such as LabVIEW 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+)
- **Keysight** VEE and OpenTAP
- **Mathworks** Matlab
- **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, please 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, please go to: pickeringtest.com/spm
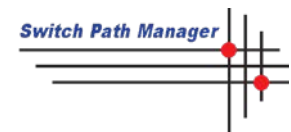
Diagnostic Relay Test Tools

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, please 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 a period of three years from the date of delivery to the original purchaser. Extended warranty and service agreements are available for all our modules and systems with various levels to suit 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, please go to: pickeringtest.com/support

Available Product Resources

We have a large library of product resources including success stories, product and support videos, articles and white papers as well as application specific product brochures to assist when looking for the switching, simulation and connection solutions you need. We have also published handy reference books on Switching Technology and for the PXI and LXI standards.

To view, download or request any of our product resources, please visit: pickeringtest.com/resources

pickeringtest.com