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PXI High Density Precision Resistor Module 40-298

- High Density Resistor Simulation
- Fitted With Pickering Reed Relays, Providing Superior Speed of Operation & Module Life
- Up To 18 Channels in a One Slot Module
- Resistance Resolution to 0.125Ω
- Values From 2Ω to 22MΩ
- Accuracy of ±0.2% ± Resolution
- Short and Open Simulation
- Simple Software Control Through Resistance Calls
- VISA & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- 3 Year Warranty

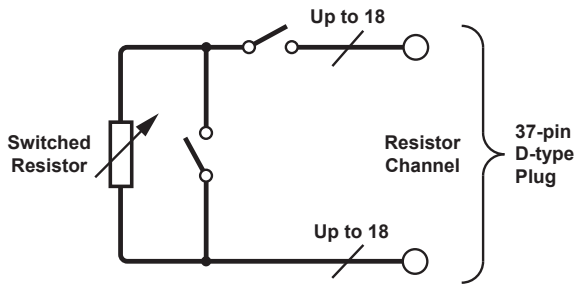


The 40-298 provides a simple solution for applications requiring accurate simulation of resistive sensors. It is available in a variety of resistance ranges and resolutions to meet the needs of functional test systems. It is suitable for engine controller testing where resistive sensors provide information such as temperature.

The 40-298's channels are able to be set as short or open circuit to simulate a wiring or sensor fault.

Software control is simplified by the use of resistor value calls. The module works out the channel setting closest to the requested value and sets that value. The user can interrogate the module to find the actual resistance setting used by the module.

A calibration cable can be attached to the module allowing a DMM to be used to verify each channel. This considerably simplifies the checking of the module's calibration. Verification is performed with the UUT disconnected from the module.



Functional Diagram for the 40-298 High Density Precision Resistor Module

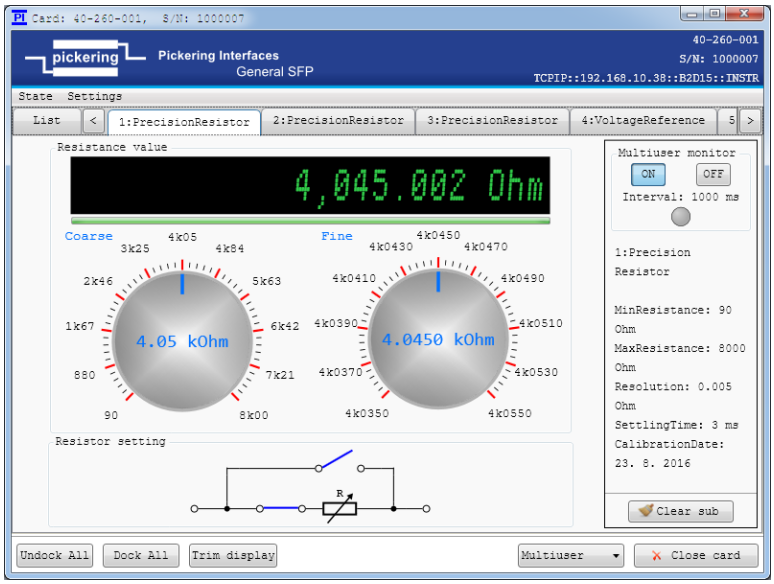
Pickering's Range of PXI Precision Resistor Modules					
Model	**Description**	**Chan.**	**Range**	**Resolution**	**Accuracy**
40-260	Precision Programmable Resistor	3	90Ω to 8kΩ	<10mΩ	0.1%
40-261		2	1.5Ω to 2.9kΩ or 10Ω to 36kΩ	<2mΩ or <15mΩ	0.08%
40-262	RTD Simulator	18, 12 or 6	90Ω to 250Ω or 900Ω to 2.5kΩ	<8mΩ or <90mΩ	0.1%
40-263		4, 8, 12, 16, 20 or 24	40Ω to 900Ω, 200Ω to 4.5kΩ or 400Ω to 9kΩ	<10mΩ, <50mΩ or <100mΩ	0.1%
40-265	Strain Gauge Simulator	6, 4 or 2	350Ω, 1kΩ, 1.5kΩ, 2kΩ or 3kΩ	<2mΩ, <10mΩ, <12.5mΩ, <20mΩ or <25mΩ	0.03% or 0.06%
40-297	High Density Precision Resistor	18, 9, 6, 4 or 3	Up to 22.3MΩ	0.125Ω, 0.25Ω, 0.5Ω, 1Ω or 2Ω	0.2%
40-298	High Density Precision Resistor	18, 9, 6, 4 or 3	Up to 22.3MΩ	0.125Ω, 0.25Ω, 0.5Ω, 1Ω or 2Ω	0.2%
Standard Resistor Modules					
For applications that do not require the precision or accuracy of our precision range, look to our Standard Resistor range which includes models 40-280/1/2, 40-290/1, 40-292, 40-293, 40-294 and 40-295/6					
Custom Resistor Modules					
If our range of Resistor Modules does not meet your specific requirements, please contact you local sales office to discuss your application. Customizations include: different start and stop values, current, power, voltage, precision, accuracy, number of channels, connector etc.					

The 40-298 is available in 50 standard builds that suit the most common configurations required:

- A narrow resistance range version with 9 or 18 channels.
- A medium resistance range version with 4 or 9 channels.
- A wide resistance range version with 3 or 6 channels.

For applications requiring greater resolution and accuracy, or to support verification with the UUT connected, users should consider the **40-260 series Precision Resistor Modules**.

ISSUE 1.0 APR 2020



Soft Front Panel for Programmable Resistor Modules

PXI Part Number (Number of Channels)		Resistance Range: 1Ω 10Ω 100Ω 1kΩ 10kΩ 100kΩ 1MΩ 10MΩ 100MΩ	Resolution
40-298-010 (18)	40-298-110 (9)		0.125Ω
40-298-011 (18)	40-298-111 (9)		0.25Ω
40-298-012 (18)	40-298-112 (9)		0.5Ω
40-298-013 (18)	40-298-113 (9)		1Ω
40-298-014 (18)	40-298-114 (9)		2Ω
40-298-020 (9)	40-298-120 (4)		0.125Ω
40-298-021 (9)	40-298-121 (4)		0.25Ω
40-298-022 (9)	40-298-122 (4)		0.5Ω
40-298-023 (9)	40-298-123 (4)		1Ω
40-298-024 (9)	40-298-124 (4)		2Ω
40-298-030 (9)	40-298-130 (4)		0.125Ω
40-298-031 (9)	40-298-131 (4)		0.25Ω
40-298-032 (9)	40-298-132 (4)		0.5Ω
40-298-033 (9)	40-298-133 (4)		1Ω
40-298-034 (9)	40-298-134 (4)		2Ω
40-298-040 (6)	40-298-140 (3)		0.125Ω
40-298-041 (6)	40-298-141 (3)		0.25Ω
40-298-042 (6)	40-298-142 (3)		0.5Ω
40-298-043 (6)	40-298-143 (3)		1Ω
40-298-044 (6)	40-298-144 (3)		2Ω
40-298-050 (6)	40-298-150 (3)		0.125Ω
40-298-051 (6)	40-298-151 (3)		0.25Ω
40-298-052 (6)	40-298-152 (3)		0.5Ω
40-298-053 (6)	40-298-153 (3)		1Ω
40-298-054 (6)	40-298-154 (3)		2Ω

Graphical Representation of the 40-298 Precision Resistor Module Range

Relay Type

The 40-298 is fitted with Pickering reed relays with sputtered ruthenium contacts. A spare relay is built onto the circuit board to allow easy maintenance with minimum downtime.

Specification

Accuracy:	0.2% ±Resolution @ ±10°C from calibration temperature (factory calibration @ 21°C)
Fault Simulation:	Open and short circuit (typically <0.5Ω)
Max Power:	0.5W
Max Voltage:	100V* or as limited by power
Thermal Offset	<100µV
Settling Time:	0.5ms †
Software Control:	By resistance calls to module for selected channel.
Calibration:	4-wire resistance measurement of selected channel for verification purposes with UUT removed and a special cable assembly attached. Factory calibration data is stored in the module.
Expected Life (operations):	1000 million (10mA)

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

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

Power Requirements

+3.3V	+5V	+12V	-12V
0.2A	0.9A max	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 37-pin male D-Type connector.

Operating/Storage Conditions

Operating Conditions

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

Storage and Transport Conditions

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

PXI & CompactPCI Compliance

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

Uses a 33MHz 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.

Product Order Codes

0.125Ω Resolution

Range	No. of Channels	Order Code	No. of Channels	Order Code
2Ω to 31.5Ω	9	**40-298-110**	18	**40-298-010**
2.5Ω to 472Ω	4	**40-298-120**	9	**40-298-020**
3Ω to 6.97kΩ	4	**40-298-130**	9	**40-298-030**
3.5Ω to 102kΩ	3	**40-298-140**	6	**40-298-040**
4Ω to 1.51MΩ	3	**40-298-150**	6	**40-298-050**

0.25Ω Resolution

Range	No. of Channels	Order Code	No. of Channels	Order Code
2Ω to 62.1Ω	9	**40-298-111**	18	**40-298-011**
2.5Ω to 925Ω	4	**40-298-121**	9	**40-298-021**
3Ω to 13.6kΩ	4	**40-298-131**	9	**40-298-031**
3.5Ω to 201kΩ	3	**40-298-141**	6	**40-298-041**
4Ω to 2.97MΩ	3	**40-298-151**	6	**40-298-051**

0.5Ω Resolution

Range	No. of Channels	Order Code	No. of Channels	Order Code
2Ω to 122Ω	9	**40-298-112**	18	**40-298-012**
2.5Ω to 1.81kΩ	4	**40-298-122**	9	**40-298-022**
3Ω to 26.7kΩ	4	**40-298-132**	9	**40-298-032**
3.5Ω to 395kΩ	3	**40-298-142**	6	**40-298-042**
4Ω to 5.82MΩ	3	**40-298-152**	6	**40-298-052**

1Ω Resolution

Range	No. of Channels	Order Code	No. of Channels	Order Code
2Ω to 239Ω	9	**40-298-113**	18	**40-298-013**
2.5Ω to 3.55kΩ	4	**40-298-123**	9	**40-298-023**
3Ω to 52.4kΩ	4	**40-298-133**	9	**40-298-033**
3.5Ω to 773kΩ	3	**40-298-143**	6	**40-298-043**
4Ω to 11.4MΩ	3	**40-298-153**	6	**40-298-053**

2Ω Resolution

Range	No. of Channels	Order Code	No. of Channels	Order Code
2Ω to 470Ω	9	**40-298-114**	18	**40-298-014**
2.5Ω to 6.97kΩ	4	**40-298-124**	9	**40-298-024**
3Ω to 102kΩ	4	**40-298-134**	9	**40-298-034**
3.5Ω to 1.51MΩ	3	**40-298-144**	6	**40-298-044**
4Ω to 22.3MΩ	3	**40-298-154**	6	**40-298-054**

Accessories:

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

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

Adapter to convert from male 37-pin D-type to male 78-pin D-type, converting from 2-wire to 4-wire channel connections. Please contact you local sales office for details.

Mating Connectors & Cabling

For connection accessories for the 40-298 series 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, 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

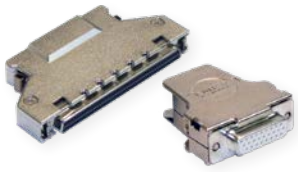


Pickering LXI or LXI/USB Modular Chassis—only accept our 1000+ PXI Switching & Simulation Modules:

- 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

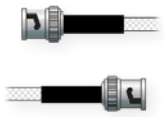
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed to mechanically and electrically mate to our modules.



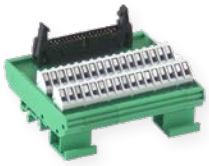
Connectors & Backshells



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.



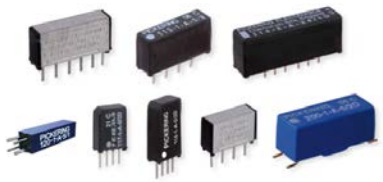
Mass Interconnect

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 sister company, Pickering Electronics. 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



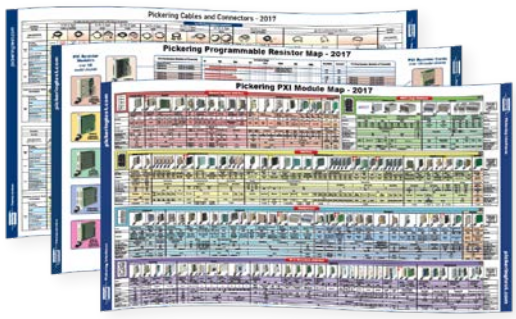
Three Year Warranty & Guaranteed Long-Term Support

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, as well as complete product catalogs and product reference maps to assist when looking for the switching, simulation and cable and connector 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

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Pickering Interfaces maintains a commitment to continuous product development, consequently we reserve the right to vary from the description given in this data sheet.

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Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

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Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

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