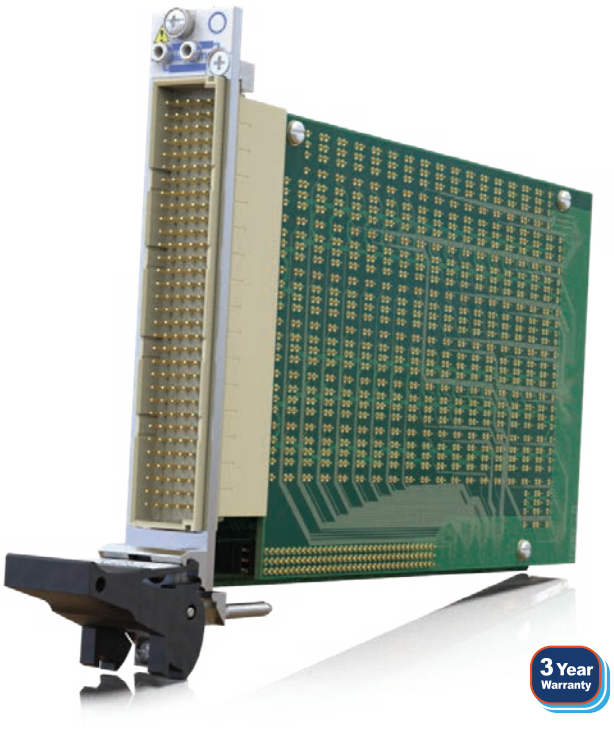
PXI/PXIe 2 A Fault Insertion Switch

4x-190C

- Available as PXI or PXIe Modules
- 74, 64 or 32 Fault Insertion Channels
- Normally Closed Through Relays
- 2 Fault Insertion Buses
- Suitable for Automotive/Avionics ECU Burn-in/ Endurance Test Applications
- High Density Low Cost Solution
- Simulation of Various Types of Electrical Fault, Enabling Rigorous Fault Testing
- Fault Bus MUX For Selecting External Fault Conditions
- High Simultaneous Relay Drive
- 2A Hot or Cold Switching with 60 W Max Power
- Switch up to 300 VDC/250 VAC
- Relay Cycle Counting Included
- Drivers Supplied for Windows & Linux, Plus Support for Real-time Systems
- PXI Versions Supported by PXI or LXI Chassis
- Supported by ***eBIRST*** ™
- 3 Year Warranty



The 40-190C (PXI) and 42-190C (PXIe) are fault insertion switches available with 74, 64 or 32 channels. They are primarily designed for the simulation of fault conditions in automotive & avionics applications involving the reliability testing of safety critical controllers. They have the ability to insert 3 different fault conditions between the test fixture and the equipment under test:

- Open-Circuit
- Short-Circuit between UUT connections
- Short-Circuit to other signals such as Power, Ignition and Ground via a Fault Insertion Bus

Through relays on each channel enable signals to the UUT to be held open-circuit. The module has two Fault Insertion Buses that allow any channel to be shorted to any other channel also enabling connection to an external fault condition. A four channel multiplexer on each bus allows an external signal such as Power, Ignition or Ground to be selected as the fault condition. Additionally, switched signal lines (Monitor1 & Monitor2) allow direct monitoring of the fault buses with a DMM.

The module has separate fault bus connections on the UUT side and test equipment side of the through relays - see the schematic diagram.

The through relays of the module are normally closed in the default (power off) condition, giving an un-interrupted path between the test fixture and the equipment under test. All the fault insertion relays are normally open in the default condition.

High Simultaneous Drive

Any combination of relays may be operated (providing the maximum total card switch current is not exceeded), enabling maximum flexibility for fault selection.

Supported by *eBIRST*

eBIRST test tools simplify switching fault-finding by quickly testing the system and graphically identifying the faulty relay.

For more information go to: pickeringtest.com/ebirst

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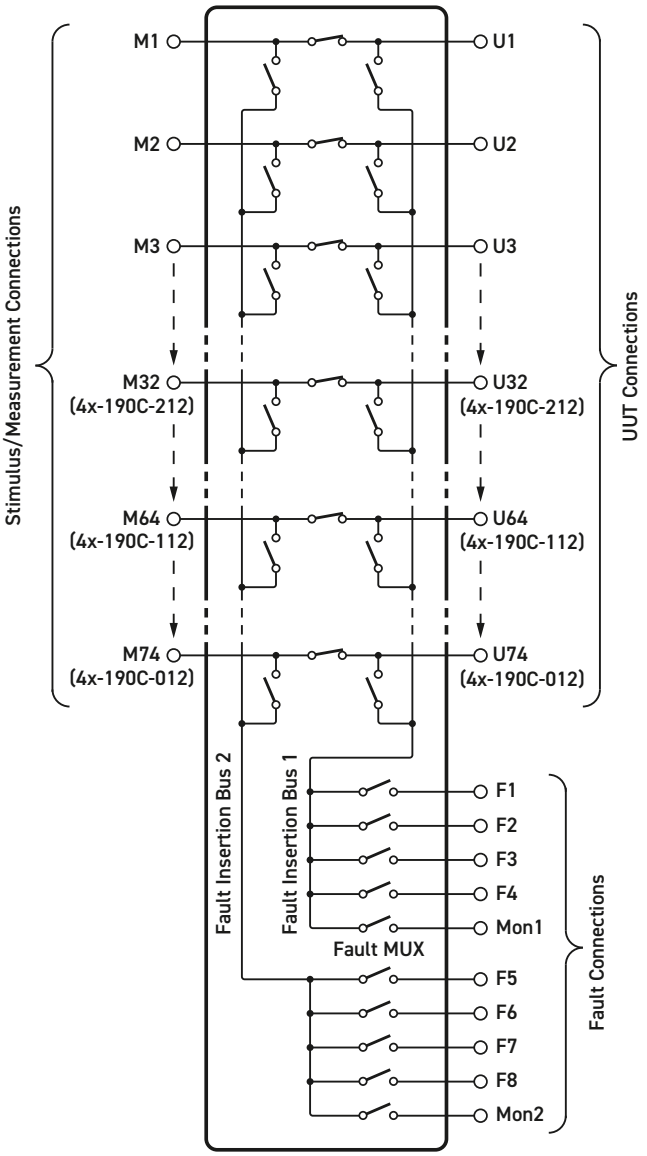
Relay Cycle Counting

To aid with module "health" monitoring all versions are provided with a relay cycle counting cycle feature. The number of operations per contact are stored on the module and can be used to determine if a relay is approaching EOL. This information could allow system connections to be revised so that signals applied to heavily used contacts are swapped with lightly used contacts to prolong the working life of the relay(s).

Other Fault Insertion Switches from Pickering

Pickering's Range of PXI/PXIe Fault Insertion Switches					
Model No.	Signal Channels	Fault Buses	Fault Inputs	Max Voltage	Max Current or Bus Type
4x-190C	74, 64 or 32	2	8	300 V	2 A
40-191A	6	2	2	40 V	30 A
40-192	6	2	2	200 V	10 A
40-193	7	1 or 2	1 or 2	16 V	20 A, 1A min
40-194	7	1 or 2	1 or 2	16 V	20 A, no min
40-195	22 or 11 pairs	—	8 or 4	150 V	1 A
40-196	10 or 5 pairs	—	10 or 5	110 V	5 A
40-197A	34 or 16	4	8	300 V	2 A
40-198	20	1 or 2	3 or 6	250 V	5 A
40-199	10	1 or 2	2	250 V	10 A
40-200	4 or 8 differential	4	8	100 V	CAN, FlexRay
40-201	4 or 8 differential	2	4	100 V	Ethernet /AFDX /BroadR -Reach
40-202	22 or 11 pairs	—	22 or 11	150 V	2 A
4x-203	3 or 6 differential	2	2	200 V	1000Base-T1
4x-204	1 or 2 differential	2	2	200 V	1000Base-T1

4x-190C-012/112/212 Switching Overview



4x-190C-012/112/212 Fault Insertion Switch Schematic - Normally Closed Through Paths, Dual Fault Bus With Fault Connections on "M" & "U"

Relay Type

The 4x-190C is fitted with high quality 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.

Switching Specification

Switch Type	Electro-mechanical
Contact Type:	Palladium-Ruthenium, Gold Covered Bifurcated
Max Switch Voltage:	300 VDC/250 VAC*
Max Power: Max Switch Current: Max Continuous Carry Current: Max Pulsed Carry Current (for a single switch path):	60 W 2 A 2 A 6 A for 100 ms (up to 10 % duty cycle)
Max number of simultaneously operated relays:	No Limit
Path Resistance (M to U): Path Resistance (Fault Path): Open Path Resistance: Thermal Offset:	300 mΩ typical 370 mΩ typical $>10^9$ Ω <5 µV per relay
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):	 $>1x10^8$ $>1.5x10^7$ (0.1 A 20 VDC) $>5x10^6$ (1 A 30 VDC) $>1x10^5$ (2 A 30 VDC)

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

RF Specification (Normally Closed Through Relays)

Bandwidth (-3 dB):	M to U Path: Fault Path:	20 MHz (typical) 7 MHz (typical)
Crosstalk (typical):	10 kHz: 100 kHz: 1 MHz: 10 MHz:	-80 dB -70 dB -40 dB -25 dB
Isolation (typical):	10 kHz: 100 kHz: 1 MHz: 10 MHz:	65 dB 60 dB 45 dB 30 dB

Note: The 4x-190C is suitable for carrying signals such as CAN to 1 Mbps & FlexRay to 20 Mbps (10 Mbps per channel path)

Power Requirements - 40-190C

+3.3 V	+5 V	+12 V	-12 V
150 mA (typical)	2.10 A (typical)	0	0

Power Requirements - 42-190C

+3.3 V	+12 V
390 mA (typical)	1.05 A (typical)

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

PXI & CompactPCI Compliance - 40-190C

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.

PXIe Compliance - 42-190C

The module is compliant with the PXIe Specification 1.0. Local Bus, Trigger Bus & Star Trigger are not implemented.

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.

Mechanical Characteristics

40-190C - Single slot 3U PXI (CompactPCI card).

42-190C - Single slot 3U PXIe, compatible with PXIe hybrid slot.

Module weight: 400 g (40-190C-012).

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

Connectors

40-190C - PXI bus via 32-bit P1/J1 backplane connector.

42-190C - PXIe bus via XJ3 and XJ4 backplane connectors.

Signals via front panel 160-pin male DIN 41612 connector, for pin outs please refer to the operating manual.

We recommend that Pickering mating connectors are used with this module. They are designed to ensure there are no mechanical interference problems when used in a PXI chassis.

Note: The pinout of the 40-190C is not compatible with the pinout of the earlier 40-190 Fault Insertion Switch.

Product Order Codes

PXI Fault Insertion Switches With Normally Closed Through Relays & Fault Buses on "M" & "U"	
Dual Fault Bus, 74-Channel 2A:	40-190C-012
Dual Fault Bus, 64-Channel 2A:	40-190C-112
Dual Fault Bus, 32-Channel 2A:	40-190C-212
PXIe Fault Insertion Switches With Normally Closed Through Relays & Fault Buses on "M" & "U"	
Dual Fault Bus, 74-Channel 2A:	42-190C-012
Dual Fault Bus, 64-Channel 2A:	42-190C-112
Dual Fault Bus, 32-Channel 2A:	42-190C-212

Product Customization

Pickering 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 relay types
- Mixture of relay types
- Alternative number of relays
- 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.

Support Products

eBIRST Switching System Test Tool

This product is supported by the *eBIRST* test tools which simplify the identification of failed relays, the required *eBIRST* tools are below.
For more information go to: pickeringtest.com/ebirst

Product	Test Tool	Adaptor
4x-190C	93-002-001	93-002-410

Spare Relay Kits

Kits of replacement relays are available for the majority of Pickering's PXI switching products, simplifying servicing and reducing down-time.

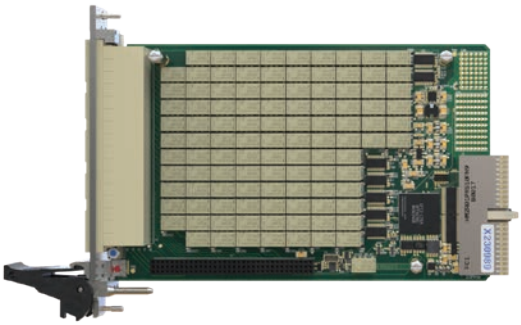
Product	Relay Kit
4x-190C (All versions)	91-100-001

For further assistance, please contact the sales office.

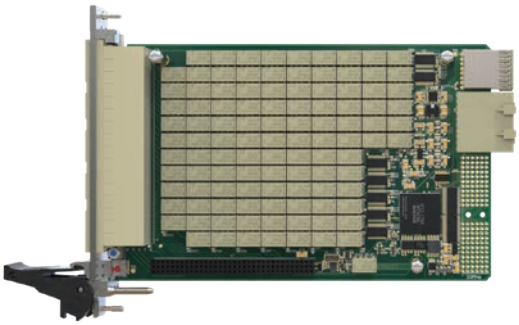
Connection Accessories

For a complete list of connection accessories and documentation for the 4x-190C module please refer to our 160-pin DIN 41612 connector datasheet (90-001D).

Pickering can supply mating 160-pin connectors and cable assemblies to enable easy integration of the 4x-190C series of fault insertion switch modules



40-190C-212 PXI 32-Channel Fault Insertion Switch Module



42-190C-212 PXIe 32-Channel Fault Insertion Switch Module

Chassis Compatibility

The PXI versions of this module are 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

The PXIe versions of this module are compatible with the following chassis types:

- All chassis conforming to the 3U PXIe specification
- PXIe and Hybrid Peripheral slots in a 3U PXI Express (PXIe) chassis

Chassis Selection Guide

PXI and PXIe (with PXIe and/or Hybrid slots) Chassis from any Vendor:

- Mix our 1000+ PXI/PXIe switching & simulation modules with any vendor's PXI/PXIe 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 PXI Switching & Simulation Modules:

- Choose from 1000+ Pickering PXI 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. 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

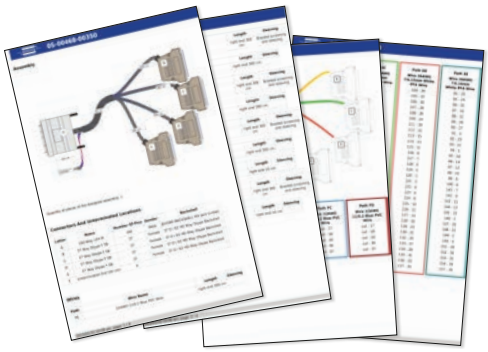
Breakouts

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



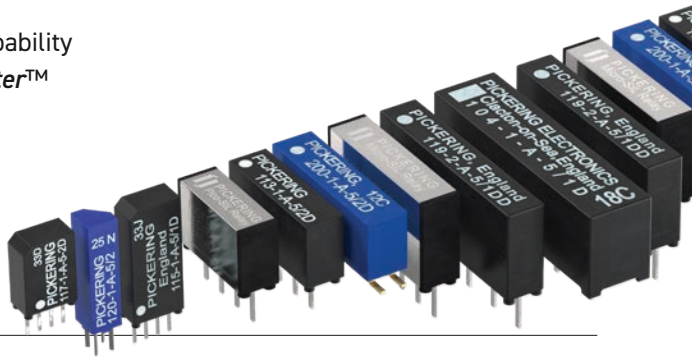
Mass Interconnect

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

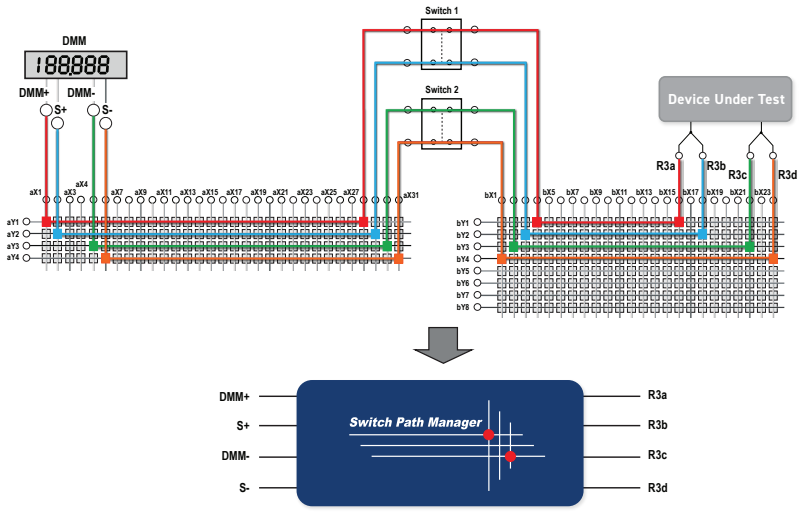
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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