

- 7 Fault Insertion Channels
- Simulation of Various Types of Electrical Fault, Enabling Rigorous Fault Testing
- Choice of 1 or 2 Fault Insertion Buses
- 20 A Hot or Cold Switching
- Switch up to 16 VDC
- VISA, IVI & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- 3 Year Warranty

The 40-193 is a 7-Channel Fault Insertion switch designed for the simulation of fault conditions in automotive systems.

It is able 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 & Ground via Fault Insertion Bus

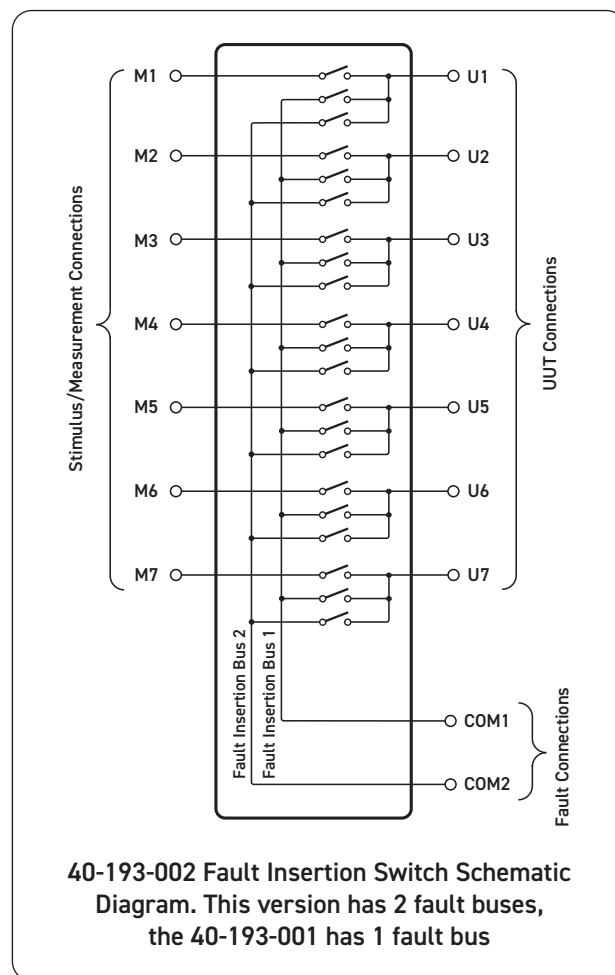
Through relays on each channel enable signals to the UUT to be held open-circuit. Fault Insertion Buses allow any channel to be shorted to any other channel and enable any channel to be connected to an external signal such as Power, Ignition or Ground to simulate fault conditions.

Range Description:

- 40-193-001 7 Channels, One Fault bus.
- 40-193-002 7 Channels, Two Fault buses.

The 40-193 uses miniature automotive relays with 20 A hot or cold switching current. All relays are normally open.

Pickering's Range of PXI Fault Insertion Switches					
Model No.	Signal Channels	Fault Buses	Fault Inputs	Max Voltage	Max Current or Bus Type
40-190B	74, 64 or 32	1 or 2	4 or 8	165 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, 1 A 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	1 A



Relay Type

The 40-193 is fitted with miniature automotive relays with silver alloy contacts. A spare relay is built onto the circuit board to allow easy maintenance with minimum downtime.

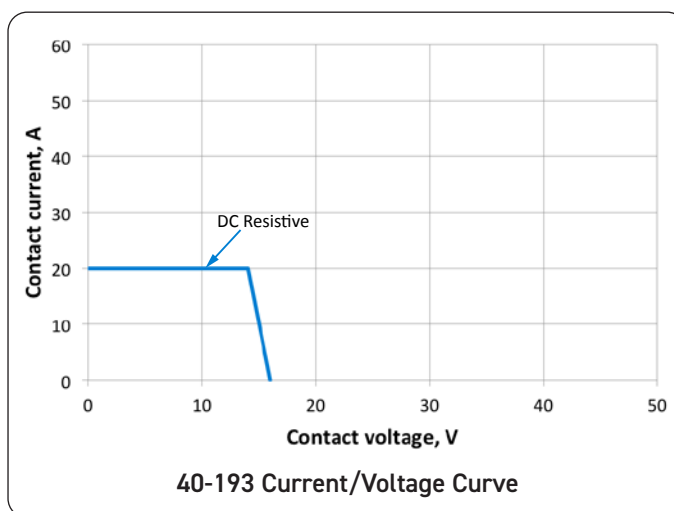
Switching Specification

Switch Type:	Electro-mechanical
Contact Type:	Silver alloy
Cold Switching Capacity	
Maximum Current:	20 A
Maximum Voltage:	16 VDC*
Hot Switching Capacity	
Maximum Current:	20 A
Maximum Voltage:	16 VDC*
Maximum Power:	280 W
Min. Switching Capacity:	1 A, 12 VDC
Max Total Fault Bus Current:	20 A
Overall Module Current:	20 A simultaneously on each stimulus connection
Initial On Path Resistance:	<15 mΩ
Off Path Resistance:	>10 ⁸ Ω
Operate Time:	10 ms typical
Max Operating Speed at nominal load:	6 cpm
Expected Life - resistive load	
Mechanical Life:	>1x10 ⁷ operations
At Max. Switch Capacity:	>1x10 ⁵ operations

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

Power Requirements

+3.3 V	+5 V	+12 V	-12 V
0	160 mA	450 mA (9 relays energised)	0



40-193 Current/Voltage Curve

Mechanical Characteristics

Double 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.
Signals via 2 front panel 8-pin male power D-Type connectors, for pin outs please refer to the operating manual.

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.

Product Order Codes

7-Channel 20 A Fault Insertion Switch:	
One Fault Bus	40-193-001
Two Fault Buses	40-193-002

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 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

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
40-193-001	91-100-070 (Relay Kit 70)
40-193-002	91-100-070 (Relay Kit 70)

For further assistance, please contact your local Pickering sales office.

Mating Connectors & Cabling

For connection accessories for the 40-193 modules please refer to the [90-012D](#) 8-pin power D-Type Connector Accessories data sheet where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.

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

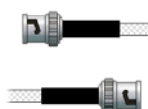
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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



Connectors & Backshells



Multiwire 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:

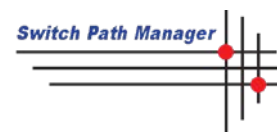
- **Pickering Interfaces Switch Path Manager**
- **National Instruments** products (LabVIEW, LabWindows/CVI, Switch Executive, MAX, TestStand, VeriStand, etc.)
- **Microsoft Visual Studio** products (Visual Basic, Visual C++)
- **Keysight** VEE and OpenTAP
- **Mathworks** Matlab
- **Marvin** ATEasy
- **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