

- Available as a PXI or PXIe Module
- 1 or 2 Pole High Voltage Multiplexer
- Single, Dual, Triple, Quad & Hex Versions
- Available With Between 4 & 48 Channels
- Hot/Cold Switch up to 1000 VDC or 1000 VAC peak, 10 W Max Power
- Dry Reed Switch Contacts With RFI Suppression for Long Life
- Hardware Interlock Provided
- Drivers Supplied for Windows & Linux, Plus Support for Real-time Systems
- PXI Versions Supported by PXI or LXI Chassis
- Supported by *eBIRST*™ Test Tools
- 3 Year Warranty



Cover not shown for clarity



The 40-321 (PXI) and 42-321 (PXIe) are high voltage multiplexers capable of hot or cold switching up to 1000 V peak. They are available in a range of bank sizes with 1 or 2 poles and channel counts between 4 and 48. High quality reed relays are used throughout the 4x-321 range.

The 4x-321 can be operated as a conventional multiplexer with break-before-make action when a new channel is selected. Alternatively, variants can be supplied that allow multiple channels to be simultaneously selected.

Applications include; circuit board isolation testing, relay testing, semiconductor breakdown monitoring and cable harness insulation testing.

RFI Suppression

The 4x-321 module includes RFI suppression that extends relay contact life in hot switching applications and controls surges caused by high voltage transients when cold switching. The suppressors also ensure safe operation when connected to a high voltage source via cable assemblies that might otherwise generate transients or RFI problems.

The suppression components result in reduced bandwidth and slightly higher path resistance compared to standard designs (please refer to the switching specification table).

Please note, it is good practice to keep high voltage switching modules away from more sensitive units to minimize crosstalk.

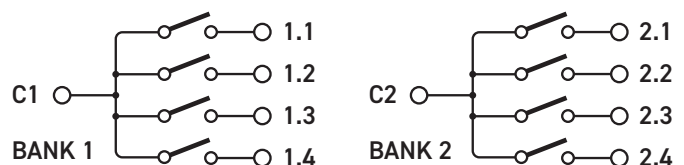
4x-321 High Voltage Multiplexer Range

- 4 Channels, Dual 1-Pole or 2-Pole
- 5 Channels, Quad 1-Pole or 2-Pole
- 7 Channels, Triple/Hex 1-Pole or 2-Pole
- 9 Channels, Single 1-Pole or 2-Pole
- 11 Channels, Dual/Quad 1-Pole or 2-Pole
- 23 Channels, Single/Dual 1-Pole or 2-Pole
- 48 Channels, Single 1-Pole or 2-Pole

Supported by *eBIRST*

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

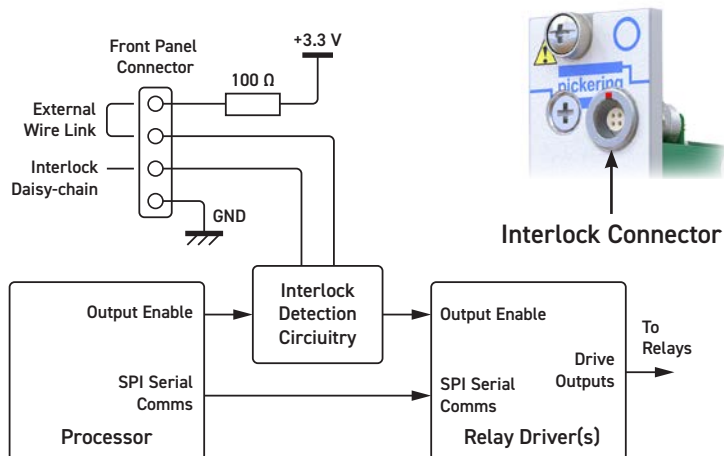
For more information go to: pickeringtest.com/ebirst



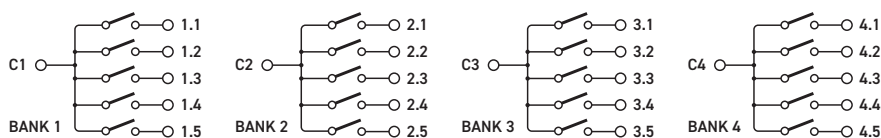
4x-321-100-HI: Dual, 4 Channel, 1 Pole, High Voltage Multiplexer

Hardware Interlock

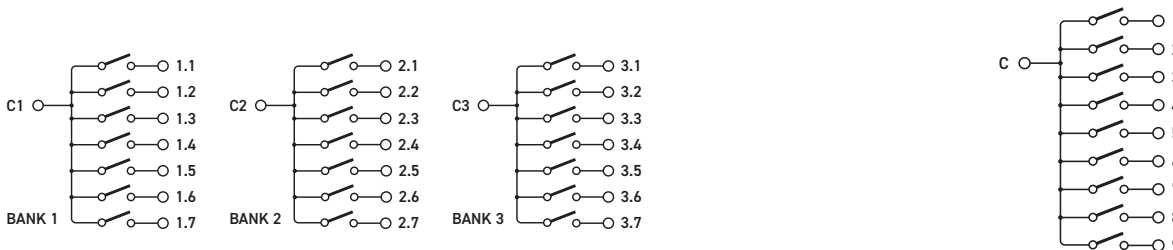
The 4x-321 modules are fitted with a hardware interlock. The interlock, when activated, will return all relays to their default unpowered state (assuming the switches are fully functional) and also provide error notification via the software interface. The interlock feature can be daisy-chained between additional hardware interlock enabled modules for example to allow one signal to disable multiple cards. For further details please refer to the Hardware Interlock section within the user manual.



Interlock Signal Routing Diagram for 4x-321

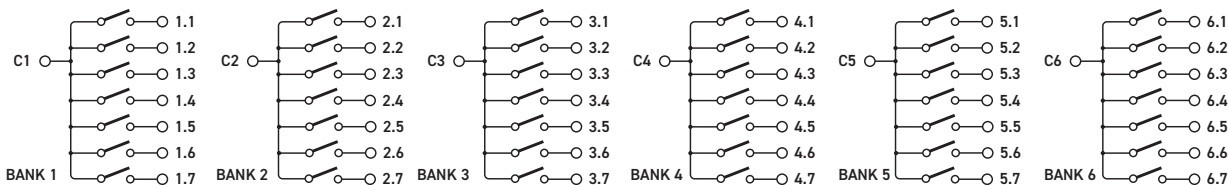


4x-321-101-HI: Quad, 5 Channel, 1 Pole

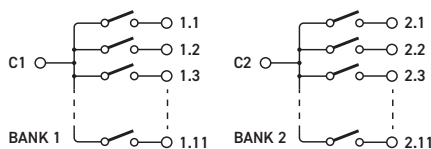


4x-321-102-HI: Triple, 7 Channel, 1 Pole

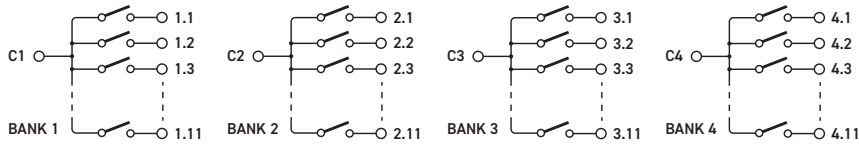
4x-321-104-HI: Single, 9 Channel, 1 Pole



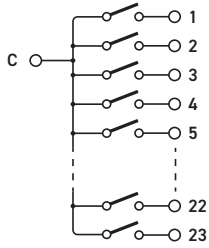
4x-321-103-HI: Hex, 7 Channel, 1 Pole



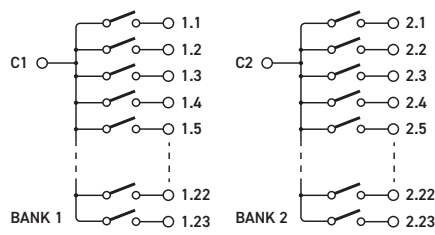
4x-321-105-HI: Dual, 11 Channel, 1 Pole



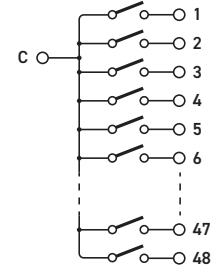
4x-321-106-HI: Quad, 11 Channel, 1 Pole



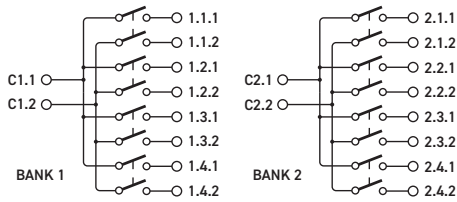
4x-321-107-HI: Single, 23 Channel, 1 Pole



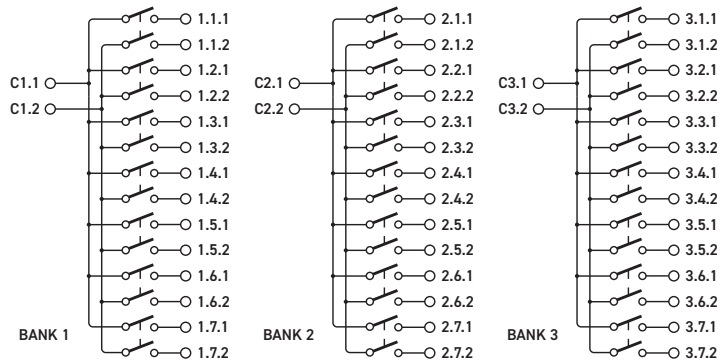
4x-321-108-HI: Dual, 23 Channel, 1 Pole



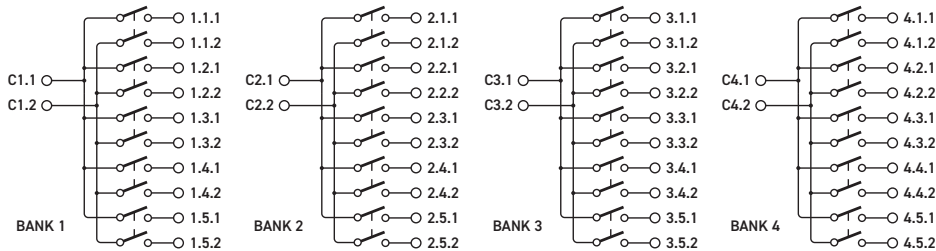
4x-321-109-HI: Single, 48 Channel, 1 Pole



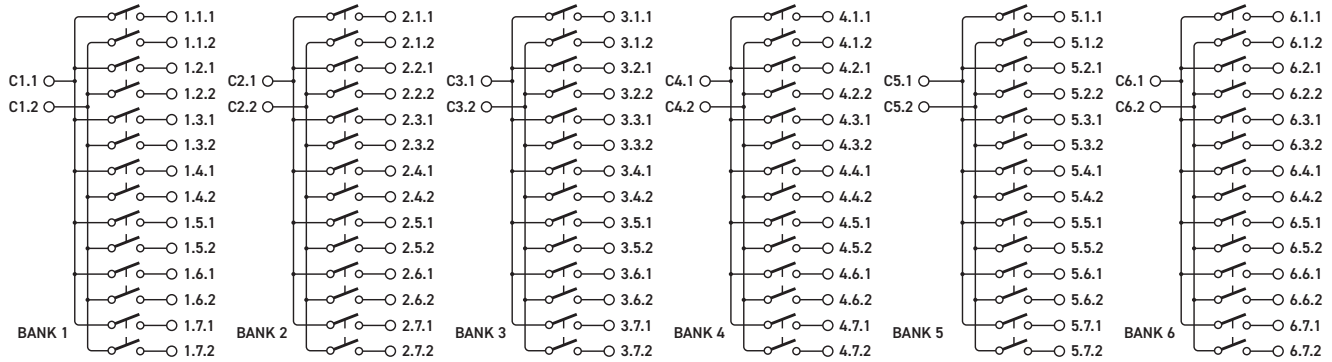
4x-321-120-HI: Dual, 4 Channel, 2 Pole



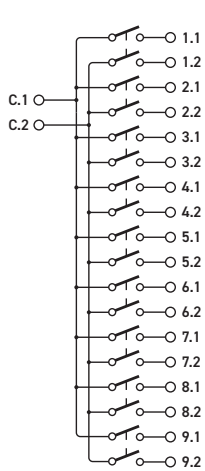
4x-321-122-HI: Triple, 7 Channel, 2 Pole



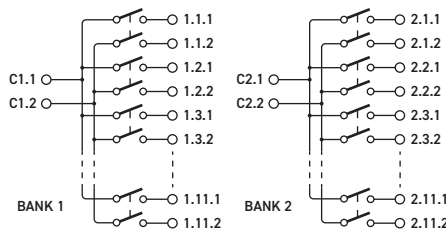
4x-321-121-HI: Quad, 5 Channel, 2 Pole



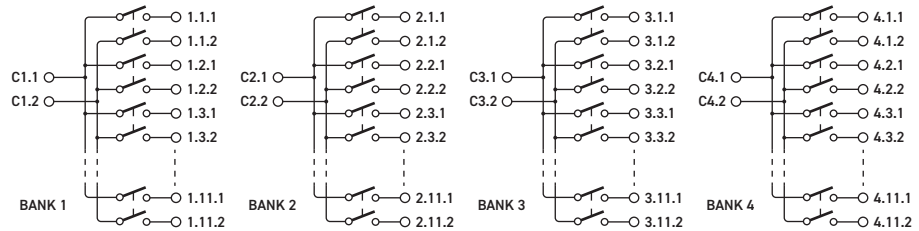
4x-321-123-HI: Hex, 7 Channel, 2 Pole



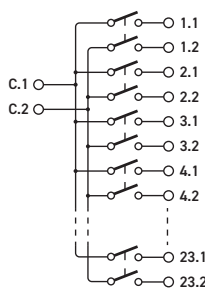
4x-321-124-HI: Single, 9 Channel, 2 Pole



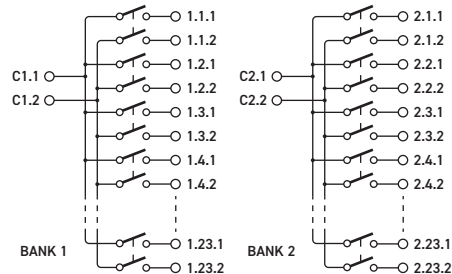
4x-321-125-HI: Dual, 11 Channel, 2 Pole



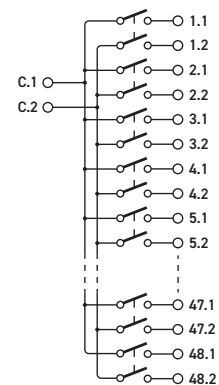
4x-321-126-HI: Quad, 11 Channel, 2 Pole



4x-321-127-HI: Single, 23 Channel, 2 Pole



4x-321-128-HI: Dual, 23 Channel, 2 Pole



4x-321-129-HI: Single, 48 Channel, 2 Pole

Relay Type

The 4x-321 is fitted with high quality ruthenium relays specifically designed for very high voltage switching and are manufactured by our Relay Division. For more information visit: pickeringrelay.com

The design uses through hole leaded style relays to ensure easy replacement with no special tools required. A spare relay is fitted to the module to enable easy servicing.

High Voltage Switching Specification

Switch Type:	Ruthenium Reed
Max Hot Switch Voltage:	1000 VDC/1000 VAC peak*
Max Cold Switch Voltage:	1000 VDC/1000 VAC peak*
Max Power:	10 W
Max Hot Switch Current:	0.7 A
Max Cold Switch Current:	1.25 A
Initial On Path Resistance:	0.25 Ω typical, 0.65 Ω max
Off Path Resistance:	>1x10 ⁹ Ω
Thermal Offset:	100 μ V
Max path capacitance:	4x-321-123 X->Y 40 pF, Y->X 60 pF 4x-321-126 X->Y 65 pF, Y->X 70 pF 4x-321-129 X->Y 35 pF, Y->X 180 pF
Operate Time:	0.6 ms typical
Expected Life:	>1x10 ⁸ operations

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

Mechanical Characteristics

40-321 - Single or dual slot (see product order code table) 3U PXI (CompactPCI card).

42-321 - Single or dual slot (see product order code table) slot 3U PXIe, compatible with PXIe hybrid slot.

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

Power Requirements - 40-321

+3.3 V	+5 V	+12 V	-12 V
0.2 A	0.35 A	0	0

Power Requirements - 42-321

+3.3 V	+12 V
0.4 A	1 A

RF Specification - In a 50 Ω System

Bandwidth (-3 dB):	1.5 MHz
Crosstalk (typical):	10 kHz: -75 dB
	100 kHz: -50 dB
	1 MHz: -40 dB
	10 MHz: -20 dB
Isolation (typical):	10 kHz: 65 dB
	100 kHz: 70 dB
	1 MHz: 60 dB
	10 MHz: 40 dB

Connectors

40-321 - PXI bus via 32-bit P1/J1 backplane connector.

42-321 - PXIe bus via XJ3 and XJ4 backplane connectors.

High voltage signals via one (single slot versions) or two (dual slot versions) front panel 50-pin male high voltage D-Type connector (see product order code table for slot occupancy).

Hardware interlock connections via 1 x 4-pin female 00 series (mating half supplied with module, to be wired by end user).

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

Product Order Codes - PXI High Voltage Multiplexer

Channel Selection	Model Variant	PXI Slots	Order Code
Single	Dual, 4 Channel, 1 Pole	1	40-321-100-HI
Single	Quad, 5 Channel, 1 Pole	1	40-321-101-HI
Single	Triple, 7 Channel, 1 Pole	1	40-321-102-HI
Single	Hex, 7 Channel, 1 Pole	2	40-321-103-HI
Single	Single, 9 Channel, 1 Pole	1	40-321-104-HI
Single	Dual, 11 Channel, 1 Pole	1	40-321-105-HI
Single	Quad, 11 Channel, 1 Pole	2	40-321-106-HI
Single	Single, 23 Channel, 1 Pole	1	40-321-107-HI
Single	Dual, 23 Channel, 1 Pole	2	40-321-108-HI
Single	Single, 48 Channel, 1 Pole	2	40-321-109-HI
Single	Dual 4 Channel 2 Pole	1	40-321-120-HI
Single	Quad 5 Channel 2 Pole	1	40-321-121-HI
Single	Triple 7 Channel 2 Pole	1	40-321-122-HI
Single	Hex 7 Channel 2 Pole	2	40-321-123-HI
Single	Single 9 Channel 2 Pole	1	40-321-124-HI
Single	Dual 11 Channel 2 Pole	1	40-321-125-HI
Single	Quad 11 Channel 2 Pole	2	40-321-126-HI
Single	Single 23 Channel 2 Pole	1	40-321-127-HI
Single	Dual 23 Channel 2 Pole	2	40-321-128-HI
Single	Single 48 Channel 2 Pole	2	40-321-129-HI

Note: The above modules are available in multiple channel selection mode by adding the "-M" suffix to the part number. For example, the PXI dual 4-channel 1-pole MUX with multiple channel capability would be: **40-321-100-HI-M**

Product Order Codes - PXIe High Voltage Multiplexer

Channel Selection	Model Variant	PXIe Slots	Order Code
Single	Dual, 4 Channel, 1 Pole	1	42-321-100-HI
Single	Quad, 5 Channel, 1 Pole	1	42-321-101-HI
Single	Triple, 7 Channel, 1 Pole	1	42-321-102-HI
Single	Hex, 7 Channel, 1 Pole	2	42-321-103-HI
Single	Single, 9 Channel, 1 Pole	1	42-321-104-HI
Single	Dual, 11 Channel, 1 Pole	1	42-321-105-HI
Single	Quad, 11 Channel, 1 Pole	2	42-321-106-HI
Single	Single, 23 Channel, 1 Pole	1	42-321-107-HI
Single	Dual, 23 Channel, 1 Pole	2	42-321-108-HI
Single	Single, 48 Channel, 1 Pole	2	42-321-109-HI
Single	Dual, 4 Channel, 2 Pole	1	42-321-120-HI
Single	Quad, 5 Channel, 2 Pole	1	42-321-121-HI
Single	Triple, 7 Channel, 2 Pole	1	42-321-122-HI
Single	Hex, 7 Channel, 2 Pole	2	42-321-123-HI
Single	Single, 9 Channel, 2 Pole	1	42-321-124-HI
Single	Dual, 11 Channel, 2 Pole	1	42-321-125-HI
Single	Quad, 11 Channel, 2 Pole	2	42-321-126-HI
Single	Single, 23 Channel, 2 Pole	1	42-321-127-HI
Single	Dual, 23 Channel, 2 Pole	2	42-321-128-HI
Single	Single, 48 Channel, 2 Pole	2	42-321-129-HI

Note: The above modules are available in multiple channel selection mode by adding the "-M" suffix to the part number. For example, the PXIe dual 4-channel 1-pole MUX with multiple channel capability would be: **42-321-100-HI-M**

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	Adapter
4x-321-1xx-HI	93-005-001	Not Required

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-321-10x-HI (1-pole)	91-100-125
4x-321-12x-HI (2-pole)	91-100-126

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

Mating Connectors & Cabling

For connection accessories for the 4x-321 modules please refer to the [90-005HVD High Voltage 50-pin D-type Connector Accessories](#) data sheet where a complete list and documentation can be found for accessories.

Accessories - Interlock Connectors

These modules are supplied with a mating connector for the hardware interlock function, spare/replacement connectors can be ordered as follows:

Connector with internal link	44-961-040
Connector only, no internal wiring (replacing that supplied with the module)	44-960-040

Overview of "Hot" & "Cold" Switching Techniques

"Hot" Switching

This is when the load is switched with the high voltage source applied. Hot switching may generate considerable RFI, both within the switching module and on interconnecting wiring. Care must be taken to suppress or shield all cabling.

Note that any precaution which adds extra capacitance to a cable should be taken with great care, even a very small capacitance at high voltages can cause very large inrush current through the module resulting in possible switch weld and excessive RFI.

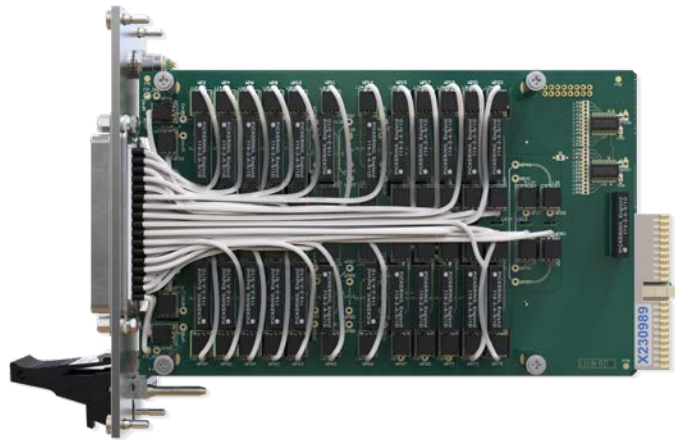
The 4x-321 modules include extensive built-in RFI suppression circuits that minimize RFI and surge problems.

"Cold" Switching – The Preferred Option for Reliability & Long Life

With cold switching, the relay is operated before the high voltage source is applied. In this case the maximum carry current is much greater, also there will be much less stress on the reed relays, resulting in improved reliability and life.

Most high voltage sources include a soft start facility which reduces the likelihood of generating RFI or temporary over-voltage.

High voltage switching modules are often used for isolation testing applications (e.g. cable, transformer or semiconductor isolation tests), in these cases, cold switching is nearly always the preferred option to reduce the risk of high voltage transients that may cause premature breakdown.



Side View of the 40-321-129 High Voltage Multiplexer With Cover Removed

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.

PXI & CompactPCI Compliance - 40-321

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

Uses a 33 MHz 32-bit backplane interface.

PXIe Compliance - 42-321

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

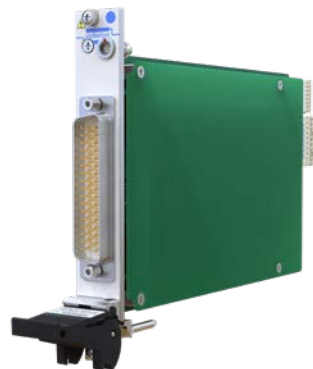
Safety & CE Compliance

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.



40-321 PXI High Voltage Multiplexer in Dual Slot Format



42-321 PXIe High Voltage Multiplexer in Single Slot Format

The 4x-321 is part of a range of switching modules suitable for high voltage applications.

Pickering's Range of PXI & PXIe High Voltage Switch Modules			
Switch Type	Max Voltage	Max Current	Model No.
8 or 16xSPST Relays	Hot Switch 750 V Cold Switch 1 kV	Hot Switch 0.5 A Cold Switch 0.5 A	40-310
12 or 24 Channel 1-Pole Multiplexer			40-320A
4 to 48 Channel Multiplexer, 1 or 2-Pole, 1, 2, 3, 4 or 6 Banks	Hot Switch 1 kV Cold Switch 1 kV	Hot Switch 0.7 A Cold Switch 1.25 A	4x-321
7xSPST Relays	Hot Switch 7.5 kV Cold Switch 9 kV	Hot Switch 0.25 A Cold Switch 0.25 A	4x-323-900
14xSPST Relays			4x-323-901
12, 18 or 24xSPST Relays	Hot Switch 110 VDC / 250 VAC Cold Switch 1 kV	5 A	40-330
1x24:1, 2x12:1, 4x6:1 6x4:1, 8x3:1 or 12x3:1 Multiplexer			40-331A
12x2 or 6x4 Matrix			40-332



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



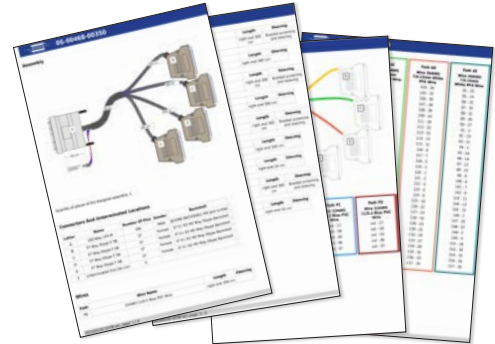
Breakouts



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

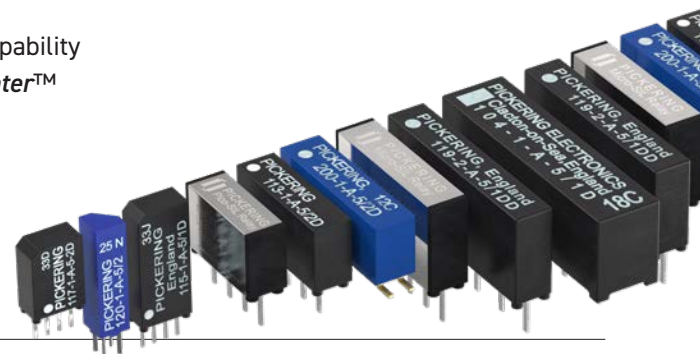
Mass Interconnect

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

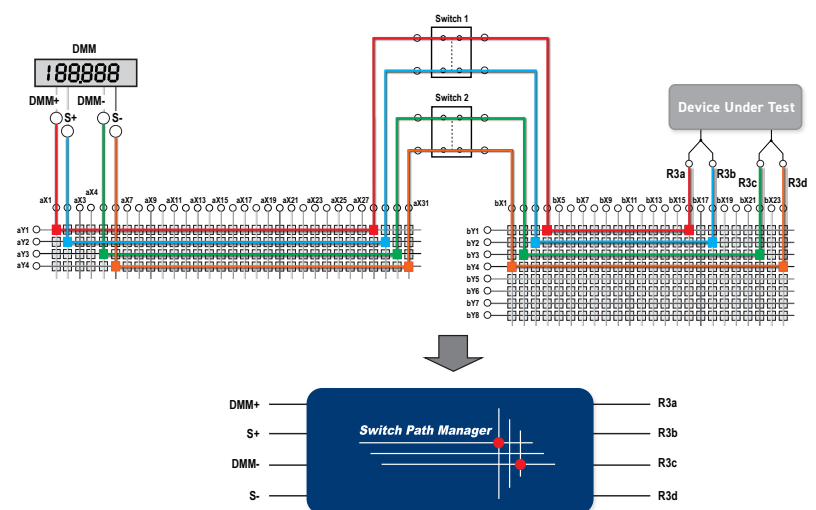
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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

