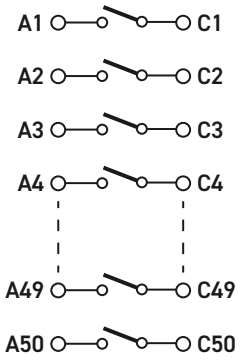
PXI/PXIe High Density Relay Module 4x-145A/146A/148A

- Available as PXI or PXIe Modules
- SPST - 50, 75 or 100 Relays Per Module
- DPST - 25 or 50 Relays Per Module
- SPDT - 32, 48 or 64 Relays Per Module
- Electro-mechanical High Density Relays
- Pin Compatible With 40-140A Series Reed Relay Modules
- Operating Speed 3 ms Typical
- Switching up to 150 V/1 A/60 W
- Single PCB Construction With Leaded Relays Allows Easy Maintenance
- 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 40-145A/146A/148A (PXI) and 42-145A/146A/148A (PXIe) range of high density switching modules are available in Normally Open (SPST & DPST), Changeover (SPDT) and Normally Closed (SPST) configurations. Connections are made via a front panel 200-pin female connector.

General purpose relay modules are suitable for the construction of small switching networks, I/O port switching, for controlling larger relays or for operating external devices such as lamps and solenoids.



High Density Relay Module - 50xSPST
(Part Number 4x-145A-001)

Range Description

- 4x-145A 50, 75 or 100 x SPST Relays (NO or NC)
- 4x-146A 25 or 50 x DPST Relays
- 4x-148A 32, 48 or 64 x SPDT Relays

High Density 200-pin Connector

We have a range of connector solutions for the 200-pin connector used on the 4x-145A, 4x-146A & 4x-148A, series of modules. These include mating connectors, pre-made cables and cable assemblies that break out the 200 conductors into more manageable 50-pin transition connectors. Please refer to our web site for more details.

This product is based on the obsolete Molex LFH series connector that has been superseded by a Pickering commissioned form, fit, function equivalent. The new connector series is 100% compatible with the Molex connectors allowing either gender of Pickering connector to mate with the corresponding Molex part without issue.

Supported by *eBIRST*

These 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

Updated Product Information

These products have been introduced as a “form & fit” update to the 40-145/146/148, the changes are to provide PXIe options. Otherwise, the electrical performance is very similar and the software and pinout are identical.

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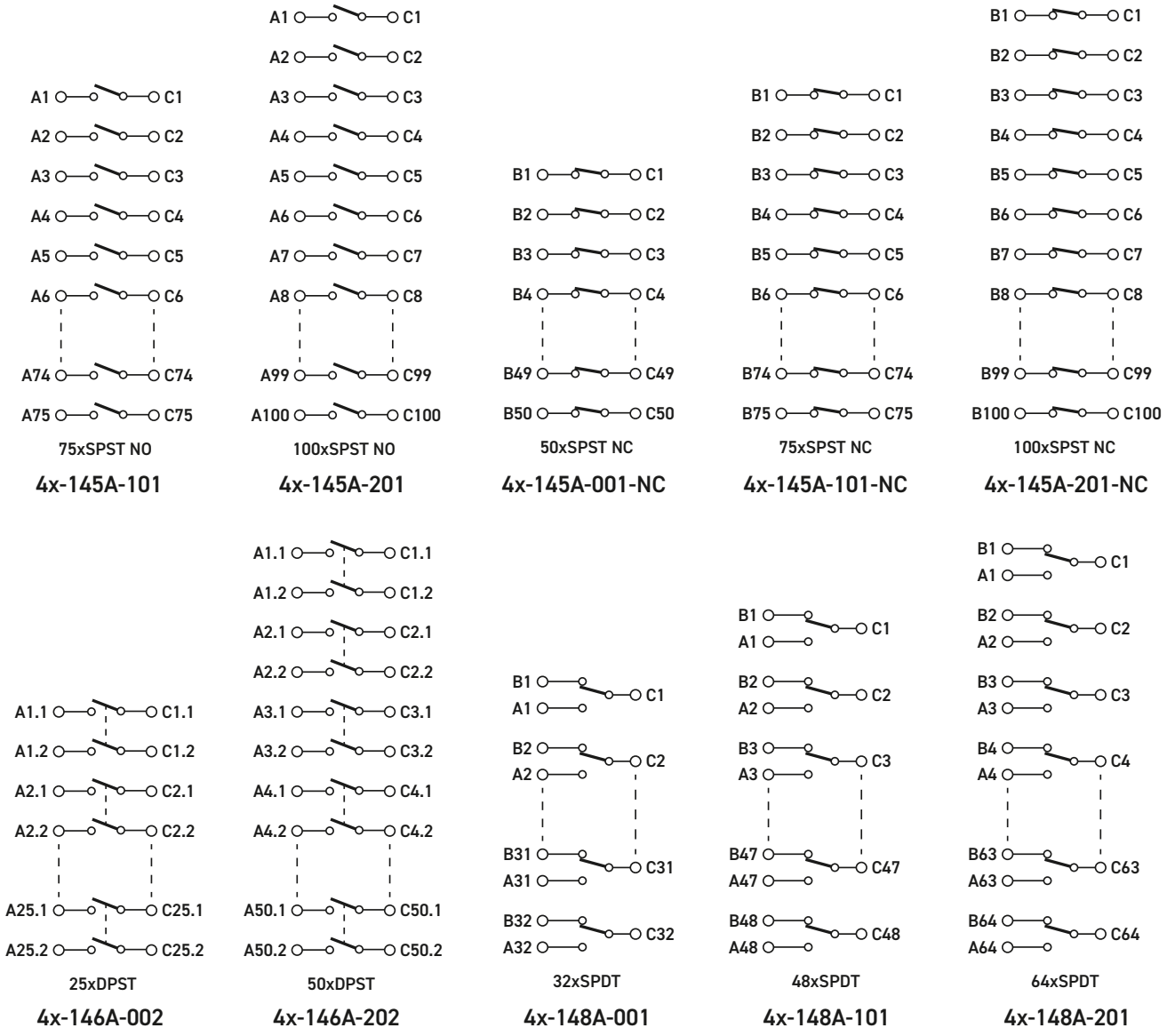


High Density Relay Module Switching Diagrams

Choice of Signal Relay Types

4x-145A/146A/148A series modules are fitted with Electro-mechanical Relays (Palladium-Ruthenium, Gold covered) offering good general purpose performance, switching times of 3 ms and are lower cost than instrumentation grade reed relays. Overall they offer a good general purpose choice.

Reed Relays (Sputtered Ruthenium Type) designed solely for high-end instrumentation applications are used in series 40-140A/141/142/143 modules, they offer very long life up to 1000 million operations, fast operate time of 0.25 ms and exceptional low level switching performance. They are hermetically sealed ensuring consistent and stable contact resistance with long life. All of the reed relays used in our products are manufactured by our Relay Division - www.pickeringrelay.com

Pin Compatibility: 40-140A/141/142/143 & 4x-145A/146A/148A series of modules are 100% pin compatible (except shielded types) allowing use of either module type in your test system. Exactly which type to select depends on your application, if in doubt please contact the Pickering sales office.

Relay Type

The 4x-145A/146A/148A are fitted with electro-mechanical signal relays. The modules are single circuit board construction and use leaded relays (not SMT) so in field maintenance is greatly simplified. In addition 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 contact
Max Switching Voltage:	150 VDC/100 VAC*
Max Power:	60 W/62.5 VA
Max Switch Current:	1 A
Max Carry Current:	1 A
Initial On Path Resistance:	400mΩ typical (4x-145A) 400mΩ typical (4x-146A) 300mΩ typical (4x-148A)
Off Path Resistance:	$>10^9$ Ω
Minimum Voltage:	100 µV
Thermal Offset:	<10 µV (4x-145A) <5 µV (4x-146A) <5 µV (4x-148A)
Operate Time:	<3 ms
Expected Life (operations)	
Very low power load:	$>1x10^8$
Low power load (2W):	$>1.5x10^7$ (0.1 A, 20 VDC)
Med power load (30W):	$>5x10^6$ (1 A, 30 VDC)
Full power load (60W):	$>1x10^5$ (1 A, 60 VDC)

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

Power Requirements - 40-145A/146A/148A

Module	+3.3 V	+5 V	+12 V	-12 V	Relays Switched
40-145A	0.15 A	0.96 A	0	0	100 (max)
40-146A	0.15 A	0.49 A	0	0	50 (max)
40-148A	0.14 A	0.62 A	0	0	64 (max)

Power Requirements - 42-145A/146A/148A

Module	+3.3 V	+12 V	Relays Switched
42-145A	0.39 A	0.44 A	100 (max)
42-146A	0.38 A	0.23 A	50 (max)
42-148A	0.37 A	0.29 A	64 (max)

RF Specification - 4x-145A (In a 50 Ω System)

Bandwidth (-3 dB):	75 MHz typical	
Crosstalk (typical):	10 kHz:	-75 dB
	100 kHz:	-70 dB
	1 MHz:	-40 dB
	10 MHz	-20 dB
Isolation (typical):	10 kHz:	65 dB
	100 kHz:	60 dB
	1 MHz:	50 dB
	10 MHz:	30 dB

RF Specification - 4x-146A (In a 50 Ω System)

Bandwidth (-3 dB):	95 MHz typical	
Crosstalk (typical):	10 kHz:	-75 dB
	100 kHz:	-70 dB
	1 MHz:	-50 dB
	10 MHz	-35 dB
Isolation (typical):	10 kHz:	65 dB
	100 kHz:	60 dB
	1 MHz:	40 dB
	10 MHz:	20 dB

RF Specification - 4x-148A (In a 50 Ω System)

Bandwidth (-3 dB):	65 MHz typical	
Crosstalk (typical):	10 kHz:	-65 dB
	100 kHz:	-60 dB
	1 MHz:	-45 dB
	10 MHz	-30 dB
Isolation (typical):	10 kHz:	65 dB
	100 kHz:	60 dB
	1 MHz:	50 dB
	10 MHz:	30 dB

Mechanical Characteristics

40-145A/146A/148A - Single slot 3U PXI (CompactPCI card).
42-145A/146A/148A - Single slot 3U PXIe, compatible with PXIe hybrid slot.

Module weight: 200g (4x-145A-201)
165g (4x-146A-202)
180g (4x-148A-201)

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

Connectors

40-145A/146A/148A - PXI bus via 32-bit P1/J1 backplane connector.

42-145A/146A/148A - PXIe bus via XJ3 and XJ4 backplane connectors.

Signals via front panel 200-pin female LFH* connector, for pin outs please refer to the operating manual.

* LFH relates to the obsolete Molex connector series and is retained for continuity, products will be fitted with a form, fit, function Pickering equivalent connector that is intermateable with the original Molex parts.

PXI & CompactPCI Compliance - 40-145A/146A/148A

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 - 42-145A/146A/148A

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.

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

PXIe Version of 100xSPST Relay Module - Part Number 42-145A-201

PXI 50xSPDT Relay Module - Part Number 40-146A-202

PXI 64xDPST Relay Module - Part Number 40-148A-201

Product Order Codes

PXI High Density Relay Module, Electro-mechanical Relays	
50 x SPST, Normally Open	40-145A-001
75 x SPST, Normally Open	40-145A-101
100 x SPST, Normally Open	40-145A-201
50 x SPST, Normally Closed	40-145A-001-NC
75 x SPST, Normally Closed	40-145A-101-NC
100 x SPST, Normally Closed	40-145A-201-NC
25 x DPST	40-146A-002
50 x DPST	40-146A-202
32 x SPDT	40-148A-001
48 x SPDT	40-148A-101
64 x SPDT	40-148A-201
PXIe High Density Relay Module, Electro-mechanical Relays	
50 x SPST, Normally Open	42-145A-001
75 x SPST, Normally Open	42-145A-101
100 x SPST, Normally Open	42-145A-201
50 x SPST, Normally Closed	42-145A-001-NC
75 x SPST, Normally Closed	42-145A-101-NC
100 x SPST, Normally Closed	42-145A-201-NC
25 x DPST	42-146A-002
50 x DPST	42-146A-202
32 x SPDT	42-148A-001
48 x SPDT	42-148A-101
64 x SPDT	42-148A-201

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	Adapter
4x-145A/146A/148A	93-002-001	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-145A/146A/148A	91-100-001

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

Mating Connectors & Cabling

For connection accessories for the 4x-145A/146A/148A series please refer to the 90-002D 200-pin LFH Connector Accessories data sheet where a complete list and documentation can be found for accessories.

Pickering can supply mating 200-pin connectors and cable assemblies to enable easy integration of the 4x-145A, 4x-146A & 4x-148A series of relay modules

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

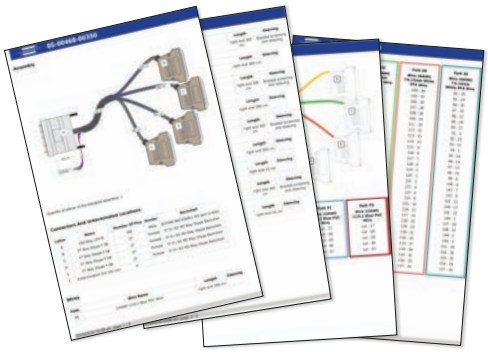
Breakouts

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



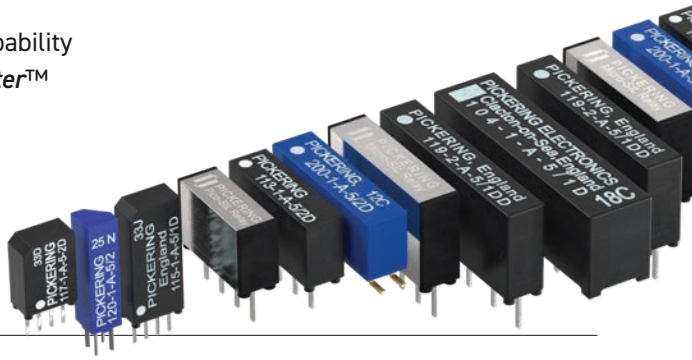
Mass Interconnect

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

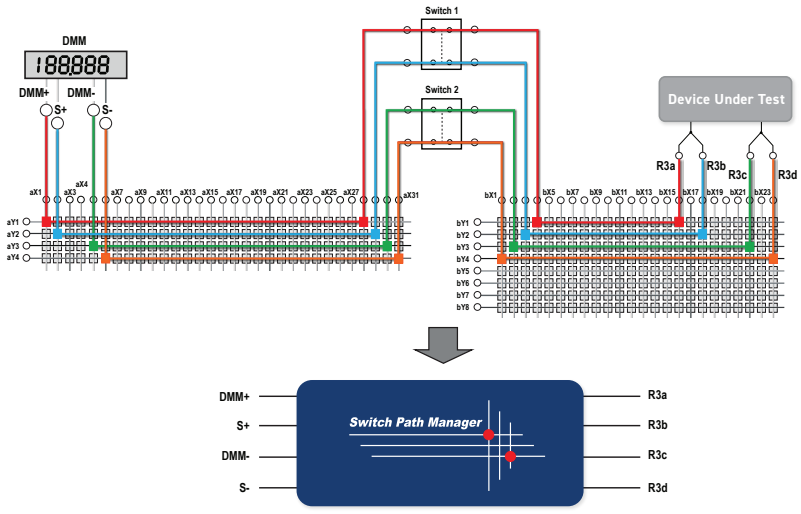
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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