# LXI High Voltage Matrix

60-310

- 2-Pole 300x2 Matrix
- Cold Switch up to 750 VDC Working / 1000 VDC Typical
- High Quality Reed Relays With Rhodium Contacts
- Hot Switch up to 500 VDC
- Maximum Carry Current of 1A
- Easily Cascaded to Create Larger Matrix
- 2U Rack Mountable Enclosure
- LXI Standard 1.4 Compliant
- IVI & Direct I/O Drivers
- 3 Year Warranty

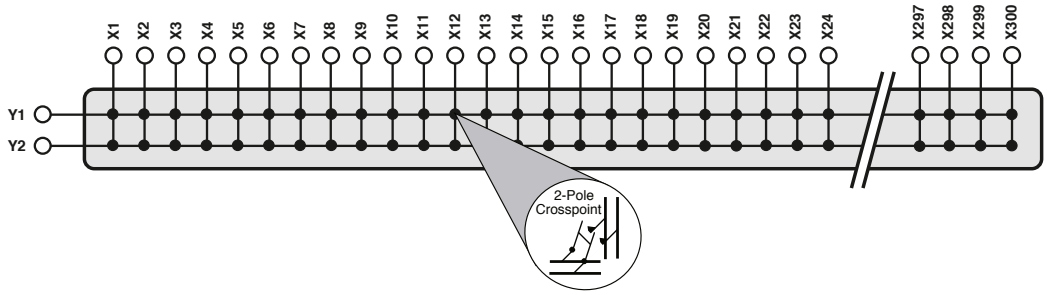
The 60-310 is a 2-pole Matrix Module available in 300x2, 200x2 and 100x2 formats. It is capable of cold switching 1000 VDC and has a maximum carry current of 1A.

It is designed for high voltage applications including circuit board isolation testing, relay testing, semiconductor breakdown monitoring and cable harness insulation testing.

The 60-310 is designed in accordance with the LXI Standard 1.4 and is supplied in a 2U high, full rack width case with 500 mm depth.

It is fully programmable via the LAN interface using Pickering Interfaces generic switch driver. Industry standard (W3C) web browsers can be used to access and change configuration information and provide access to the soft front panels, allowing control from any PC or Mac.

The 60-310 is ideal for applications where a simple start-up process is required and for applications requiring control over large distances.




**2-Pole 300x2 High Voltage Matrix Schematic Diagram (60-310-302)**

## Relay Type

The 60-310 is fitted with high quality rhodium contact reed relays specifically designed for high voltage switching. These relays are leaded types (not surface mount) so field maintenance is greatly simplified. Spare reed relays are built onto the circuit board to allow easy maintenance with minimum downtime (60-310-102 has 1 spare relay, 60-310-202 has 2 spare relays, and 60-310-302 has 3 spare relays).

All reed relays are manufactured by our sister company Pickering Electronics: pickeringrelay.com

## Switching Specification

| | |
|---|---|
| Switch Type: | Rhodium Reed |
| Max Cold Switching Voltage: | 750 VDC Working / 1000 VDC Typical* |
| Max Hot Switching Voltage: | 500 VDC* |
| Max Hot Switching Power: | 10 W |
| Max Carry Current: | 1 A |
| Path Resistance - On: | <1Ω |
| Path Resistance - Off: | $>10^9$ Ω |
| Max Number of Simultaneously Closed 2-Pole Crosspoints: | 300 |
| Operate Time: | <0.5 ms |
| Release Time: | <0.5 ms |
| Expected Life - Low Power Load: | $>1x10^8$ operations |
| Expected Life - Full Power Load: | $>5x10^6$ operations |

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

## Power Source

| | |
|---|---|
| Universal AC mains supply, 90-120/200-240 V 50-60 Hz | |
| Power Inlet: | Male IEC connector |
| Power Rating: | 100 VA maximum |
| Fuse Rating: | 5 A, 250 V |

## LAN Interface

Compliant to LXI Standard 1.4, the 60-310 has a 1000Base-T Ethernet Interface via a standard RJ-45 connector mounted on the rear panel with an LCD display showing the unit's IP address.*

*Note: Legacy units may not have 1000Base-T support or be fitted with an LCD display.

## Mechanical Characteristics

Supplied with front panel ears to enable rack mounting on a shelf or other rear support mechanism.

Dimensions: 2U high, full rack width, 500 mm depth

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

## Connectors

Signals via front panel connectors:

X connections: 50-pin male high voltage D-type (one for every 25 pairs of X connections)

Y connections: 9-pin male high voltage D-type

For pin outs please refer to the operating manual.

## Operating/Storage Conditions

| | |
|---|---|
| Operating Temperature: | 0 °C to +55 °C |
| Humidity: | Up to 95% non-condensing |
| Altitude: | 5000 m |
| Storage/Transport Temperature: | -20 °C to +75 °C |
| Humidity: | Up to 95% non-condensing |
| Altitude: | 15000 m |

## Safety & CE Compliance

All products 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

| | |
|---|---|
| 2-Pole 100x2 High Voltage Matrix | 60-310-102 |
| 2-Pole 200x2 High Voltage Matrix | 60-310-202 |
| 2-Pole 300x2 High Voltage Matrix | 60-310-302 |

## Product Customization

Pickering LXI units 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 reed relay types
- Mixture of reed 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 switching products, simplifying servicing and reducing down-time.

| Product | Relay Kit |
|---|---|
| 60-310-102/202/302 | 91-100-053 |

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

### Mating Connectors & Cabling

For connection accessories for the 60-310 please refer to the 90-005HVD High Voltage 50-pin D-type and 90-003HVD High Voltage 9-pin D-type Connector Accessories data sheets where a complete list and documentation can be found for accessories, or refer to our website.

# 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 60-310 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.

## 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

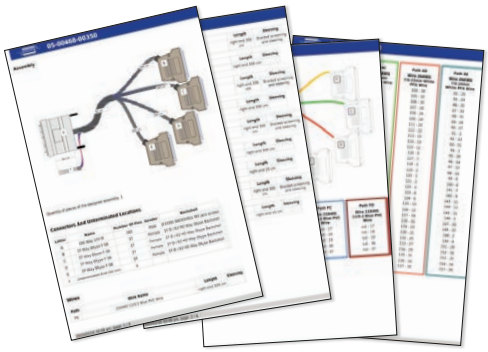
Breakouts

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



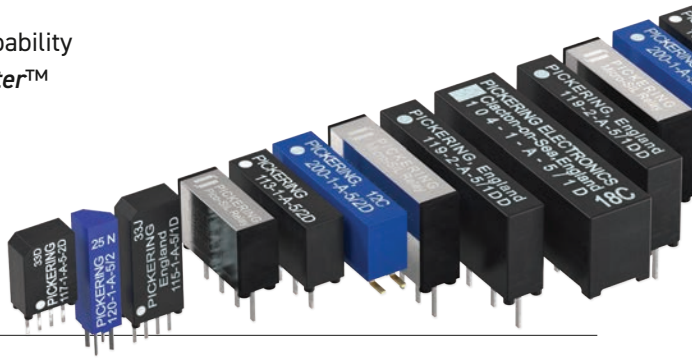
## Mass Interconnect

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

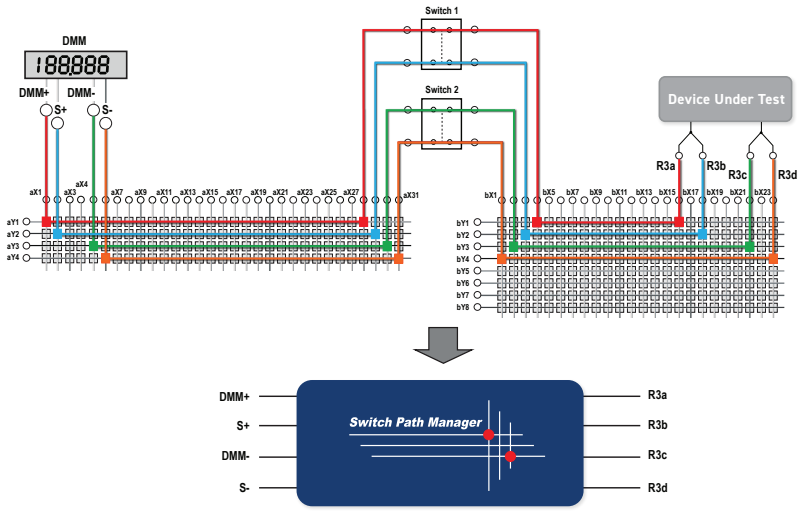
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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