

- Modular Matrix Design With 4 Y Axis Connections
- User Configurable for X Dimensions by Plugin Addition, up to 300 X Connections
- Capability to Use Internal Bus for Y Connection Between Plugin Modules
- X & Y Loop-Thru Connections Allow Easy Matrix Expansion
- Switch up to 2 A / 2 A Carry
- Cold Switch 750 VDC / Standoff 1000 VDC for 1 s With Low Duty Cycle, When Not Utilizing Chassis Internal Bus.
- Version With 1000 VDC Cold Switching / 1000 VDC Standoff
- Built-In Scan List Sequence Stores With Triggering Capability
- Supported by *BIRST*™ & *eBIRST*™ Test Tools
- Fully Compliant to 1.5 LXI Standard
- 3 Year Warranty



Pickering's Range of LXI High Voltage Matrices

Y-Axis	X Range	Poles	Model No.
4	50 to 300	1	65-218
2	100, 200 or 300	2	60-310
4	75, 150 or 225	2	60-311

The 65-218 is a modular platform that provides a large high voltage matrix solution. It consists of a 65-200 scalable chassis which can be populated with up to six 65-218 plugin matrix modules. The modules are loaded into the front of the chassis giving the best flexibility and ease of maintenance.

Each plugin module is a high voltage matrix with a carry current of 2A plus higher pulse conditions - see specification table. The plugin modules are 50x4 matrices and are available in the following types: 65-218-111 - no access to the chassis backplane and capable of cold switching 750VDC continuous. 65-218-101 - access to five separate internal buses on the chassis backplane and limited to 400 VDC cold switching. 65-218-121-CC - version with no backplane access and 1000 V cold switching.

The internal buses allow the Y connections of the matrix to be interconnected to form larger matrix sizes. Six 65-218-101 plugin modules in a 65-200 chassis can be linked to create a 300x4 matrix.

X and Y loop-thru connection on the plugin module's front panel allow the linking of 50x4 matrices within the same chassis or between adjacent chassis. This allows easy matrix expansion in both the X and Y directions.

Both types of plugin module have X isolation switches between the matrix and the front panel connector. The 65-218-101 also has Y isolation switches for the front panel connector and the six internal Y buses. Isolation switches allow unused signal paths to be disconnected to preserve signal integrity.

### Configuring the Matrix

To select the parts that you need to create a matrix simply:

- Specify a 65-200-002 LXI Scalable Chassis.
- Add Matrix Plugin Modules with or without chassis internal Y-bus access as required.

### Built-In Relay Self-Test - *BIRST*

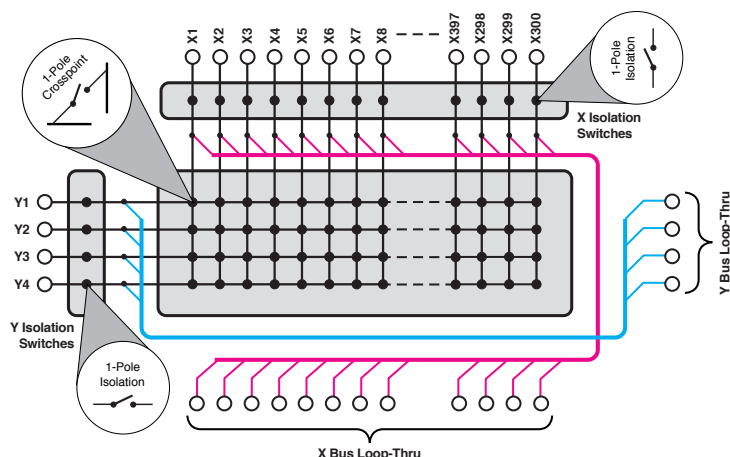
The *BIRST* facility provides a quick and easy way of finding relay failures. No test equipment is required, simply unplug the front panel connectors, launch the *BIRST* application and the tool will run a diagnostic test that will find all relays with faulty contacts.

For more information go to: [pickeringtest.com/birst](http://pickeringtest.com/birst)

### Supported by *eBIRST*

This matrix is also supported by *eBIRST*. These tools simplify switching system fault-finding by quickly testing the system and graphically identifying the faulty relay.

For more information go to: [pickeringtest.com/ebirst](http://pickeringtest.com/ebirst)



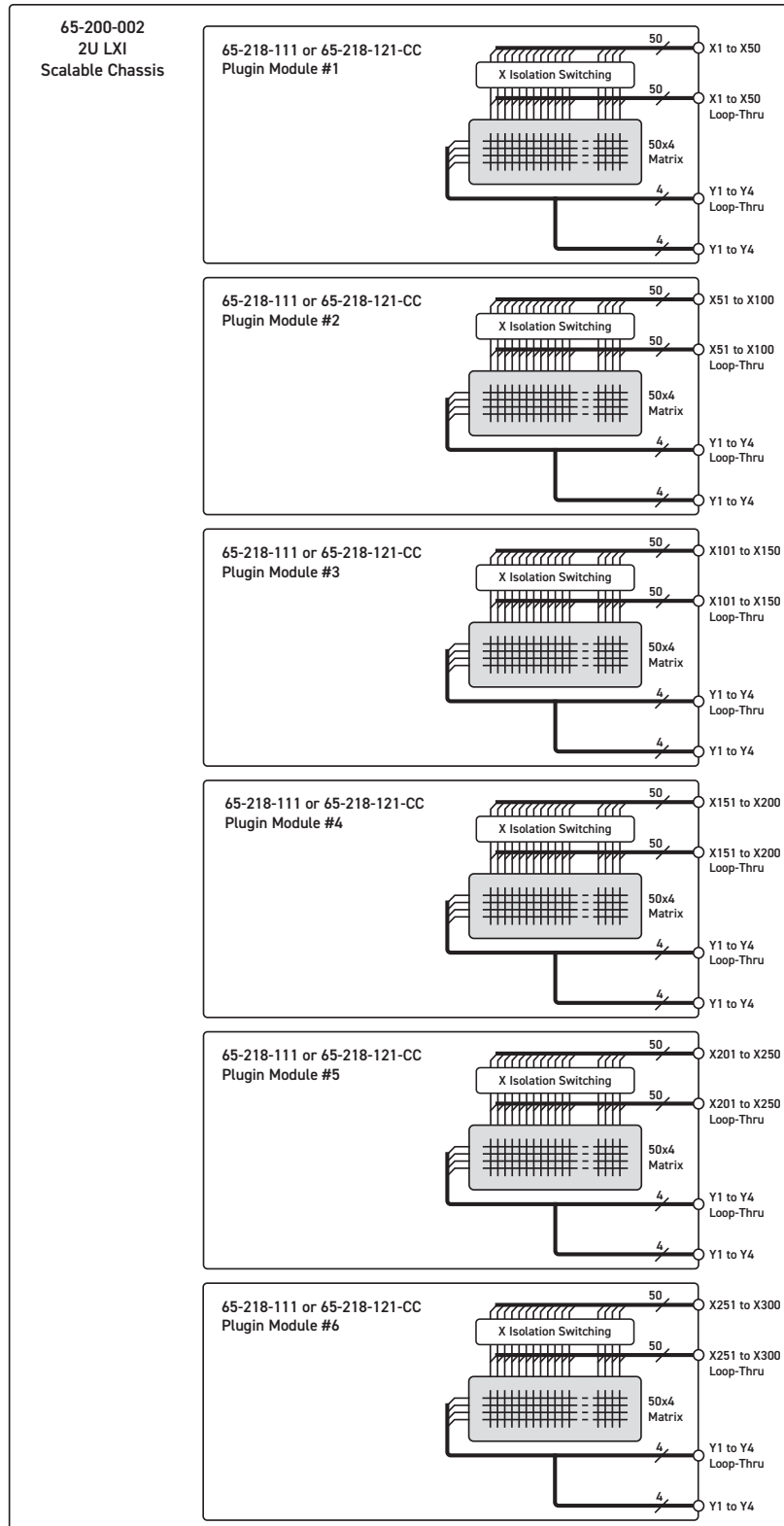
**Simplified Diagram For 65-218 Configured as a 300x4 Matrix**  
(Y Isolation Switches are only applicable to 65-218-101 Plugin)

## Example Configuration

**2 U Hex 50x4 Matrix with no chassis Y-bus access  
(750 VDC or 1000 V Cold Switch)**

Hex Matrices that permit 4 concurrent connections between Y and X or X and Y. Ability to expand matrix size using loop-thru connections

1 off 65-200-002 2U LXI Scalable Chassis  
 6 off 65-218-111 Matrix Plugin, without chassis Y-bus access (750 VDC cold switching)  
 or 6 off 65-218-121-CC Matrix Plugin, without chassis Y-bus access (1000 VDC cold switching)

**65-218 Configured as Hex 50x4 matrices with no chassis Y-bus access using:**

- 65-200-002 2 U LXI Scalable Chassis
- 6 off 65-218-111 Plugin Modules
- Or 6 off 65-218-121-CC Plugin Modules

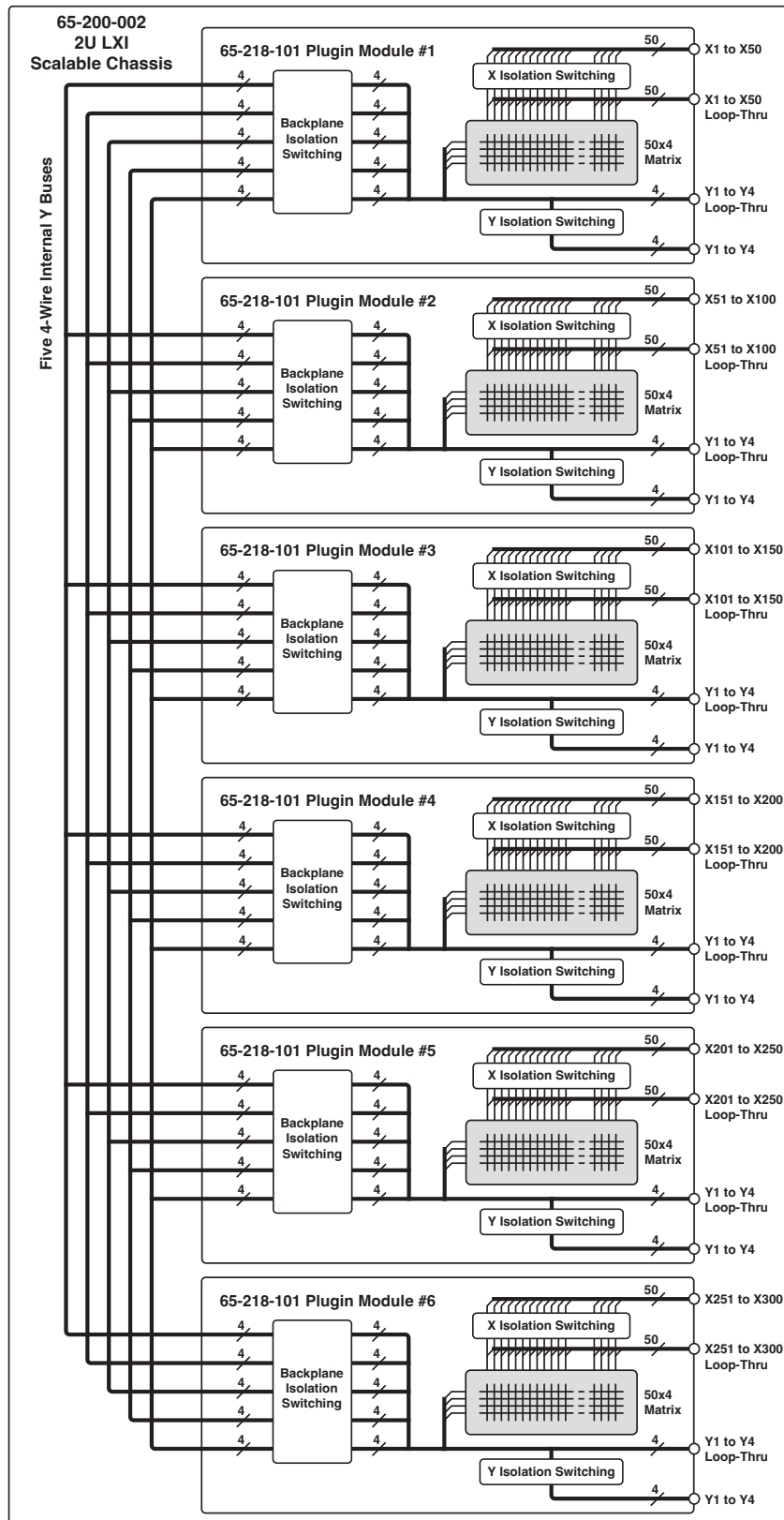
## Example Configuration

**2 U 300x4 Matrix with chassis Y-bus access (400 VDC Cold Switch)**

Matrix that permit 4 concurrent connections between Y and X or X and Y. Ability to expand matrix size using loop-thru connections

1 off 65-200-002 2 U LXI Scalable Chassis

6 off 65-218-101 Matrix Plugin, with chassis Y-bus access

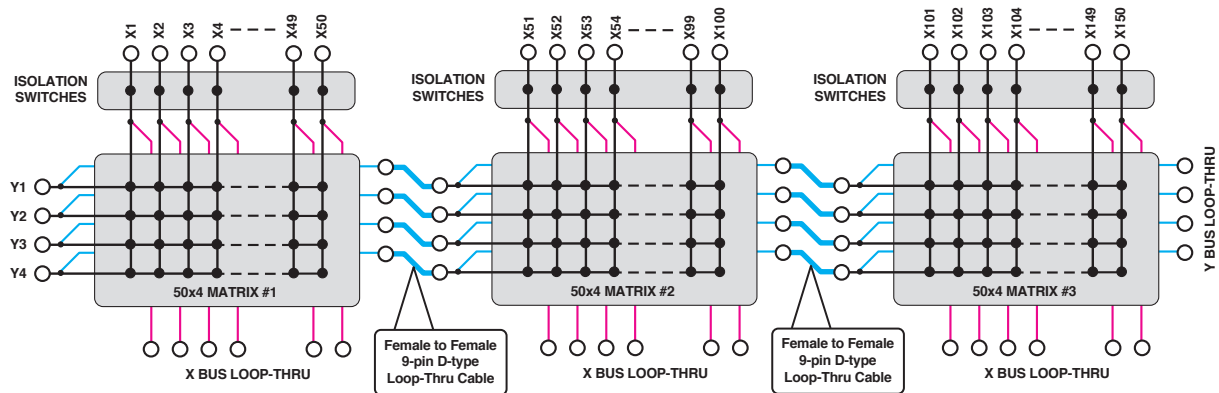


**65-218 Configured as 300x4 matrix with chassis Y-bus access using:**

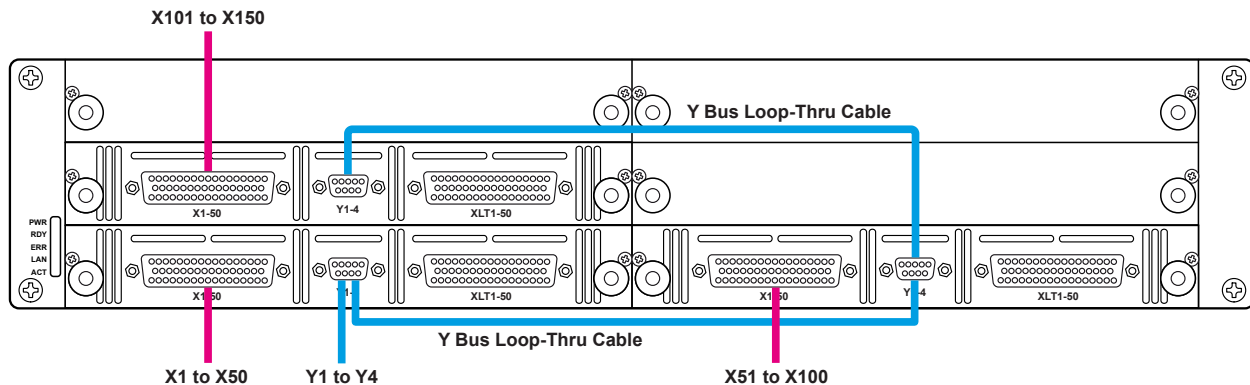
- 65-200-002 2 U LXI Scalable Chassis
- 6 off 65-218-101 Plugin Modules

## Matrix Expansion

The 65-218 may be expanded to larger matrix sizes by using cabling to daisy-chain the Loop-Thru connections. The illustrations below show how three 65-218-111 or 65-218-121-CC 50x4 matrix plugin modules can be externally interconnected as a single 150x4 matrix using female to female 9-pin D-type cables to link the Y buses. In the same way, the X Loop-Thru connections can be used to interlink the X signals to create a matrix with a wider Y bus. Additionally, the Loop-Thru connections can be used to link X and Y buses between adjacent chassis. For example, twelve 50x4 matrices housed in two separate 65-200 chassis can have their Y buses daisy-chained to produce a single 600x4 matrix. The first diagram shows the matrix schematic and the second diagram shows how the front panel connectors are cabled together.



**Schematic diagram of three 65-218-111 or 65-218-121-CC 50x4 matrix plugin modules connected as a single 150x4 matrix using Y-bus Loop-Thru connections.**



**Diagram showing the front panel cabling required to interconnect three 65-218-111 or 65-218-121-CC 50x4 matrix plugin modules as a single 150x4 matrix. The Y-bus Loop-Thru connections can be further expanded to other 65-218 Units.**

## 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 65-218 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.

## Relay Type

The 65-218 is fitted with high quality electro-mechanical relays. A spare relay is built onto the circuit boards to allow easy maintenance with minimum downtime.

## Matrix Switching Specification - Single Plugin Module

General:	Provides 4 concurrent connections between Y & X or X & Y. Ability to expand matrix size using loop-thru connections
Maximum Size:	300x4 using 6 plugins in a 65-200-002 chassis
Max Hot Switch Voltage:	220 VDC/250 VAC*
Max Cold Switch Voltage (65-218-101):	400 VDC* continuous
Max Cold Switch Voltage (65-218-111):	750 VDC* continuous & higher voltage pulse conditions, e.g. typically 1000 VDC for 1 s with low duty cycle.
Max Cold Switch Voltage (65-218-121-CC):	1000 VDC* continuous
Max Switch/Carry Current:	2 A/2 A
Max Switching Power:	60 W
Estimated Plugin Setting Time:	<5 ms (per relay or relay block operation) Note: This figure may vary depending upon user setup and network load.
Initial Path Resistance - On:	Plugin: <200 mΩ
Initial Path Resistance - Off:	>10 <sup>9</sup> Ω
Thermal Offset:	<4 μV
Crosspoint Closure Limit:	57 per plugin, 307 system level
Expected Life (operations)	
Very low power signal load:	>1x10 <sup>8</sup>
Low power load (2 W):	>1.5x10 <sup>7</sup> (0.1 A, 20 VDC)
Medium power load (30 W):	>5x10 <sup>6</sup> (1 A, 30 VDC)

\* 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:	(F) 5 A 250 V

## LAN Interface

1000Base-T Ethernet Interface with a standard RJ-45 connector mounted on the rear panel. Compliant to LXI Standard 1.5

## Matrix RF Specification - Single Plugin Module

Bandwidth (-3dB):	(Measurement at front panel) Plugin: 8.5 MHz
VSWR:	1.5:1 @ 1.98 MHz
Crosstalk (typical):	-51 dB @ 10 kHz -48 dB @ 100 kHz -35 dB @ 1 MHz -21 dB @ 5 MHz -14 dB @ 10 MHz -11 dB @ 12.5 MHz -7 dB @ 25 MHz
Isolation (typical):	71 dB @ 10 kHz 74 dB @ 100 kHz 62 dB @ 1 MHz 54 dB @ 5 MHz 49 dB @ 10 MHz 43 dB @ 12.5 MHz 30 dB @ 25 MHz

## Mechanical Specification - Scalable Chassis

Chassis Dimensions:	2 U rack mountable full width, depth 500 mm.
Number of Plugins Supported:	6 (in 65-200-002 chassis)
Plugin Weight:	0.8 Kg
Plugin Connectors:	1x 50-pin HV D-type for X connections 1x 50-pin HV D-type for X loop-thru connections 1x 9-pin HV D-type for Y/Y loop-thru connections
Trigger Connector:	25-pin male micro D-type
Cooling:	Front air intakes through plugin module holes, temperature controlled speed adjustable fans.

## Triggering

- 16x Software Configurable Bidirectional Open Collector Triggers
- 1x Dedicated Software Reset Line
- 1x Dedicated Software Fault Line
- 1x Dedicated Interlock Line

## Scan List Sequencing

Capable of storing 5000 predefined test sequences, loaded from the host Controller to the LXI unit at process initialization, with the ability to be triggered through software or from any of the sixteen software configurable triggers.

For more information on the Pickering Sequence Manager, please go to: [pickering-sequence-manager](https://www.pickeringtest.com/pickering-sequence-manager)



## Product Order Codes

Specify which modules are required to build the matrix, Pickering Interfaces will supply the chassis with the modules installed if ordered at the same time. Plugin modules can be ordered for chassis already supplied.

### Chassis

2U LXI Scalable Chassis, 6-Slot **65-200-002**

### Matrix Plugin Modules

50x4, with chassis Y bus access (400 V) **65-218-101**

50x4, without chassis Y bus access (750 V) **65-218-111**

50x4, without chassis Y bus access (1 kV) **65-218-121-CC**

### BIRST Adapter Cable

50-pin to 9-pin cable allows full coverage of BIRST diagnostics (at least one required for a 65-218 based system) **64-218-BAT509**

## Product Customization

Pickering products 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.

## 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



The 65-218 range is part of a growing family of Scalable Matrix systems available from Pickering Interfaces. Illustrated is the LXI 65-219 Modular 2 Amp Matrix, available in sizes up to 60x40.

## Support Products

### BIRST Adapter Cable

For the BIRST tool to achieve full relay coverage the **64-218-BAT509** adapter cable is required to allow the isolation switches to be tested. The cable consists of pre-wired 50-pin & 9-pin D-type sockets, and is fitted to the front panel X and Y connectors during testing - see manual for details.

### 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. This product requires master slave testing and one set of each tool is required together with the master slave cable **93-970-301**. For more information go to: [pickeringtest.com/ebirst](http://pickeringtest.com/ebirst)

Connector	Test Tool	Adaptor	Termination
50-pin	93-005-001	Not Required	93-005-101
9-pin	93-005-001	93-005-238	93-003-103

## Mating Connectors & Cabling

For connection accessories for the 65-218 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 the Connection Solutions catalog.

## 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.



Available from Pickering are the 60-102B and 60-103B 7 & 18 slot LXI Modular Chassis. These are capable of hosting any of our range of PXI switching and programmable resistor modules under LXI control via a Gigabit Ethernet interface. Also available are the 60-104, 60-105 & 60-106 USB/LXI Modular Chassis with 2, 4 & 6 slots which include USB as well as Ethernet control.

### Sequencing Service and Triggering

The Sequencing service provides the user with the ability to set a series of pre-determined sequences on an LXI instrument. These sequences can be triggered by software or one of the sixteen software configurable open collector triggers.

As the operations are grouped together, it will minimize the number of control transactions required to achieve a composite change of target switch state, condensing multiple operations in a single sub unit into a single operation, thus reducing the overall system switch settling time.

For example, if a user wants to operate X1-Y1, X4-Y1, X2-Y2, in the first sequence, only one operation, and so delay, will be used.

Additionally, as the switch state sequences are stored within the LXI controller itself, the burden on the Host CPU and Ethernet traffic is greatly reduced, and so the overall system latency is also reduced.

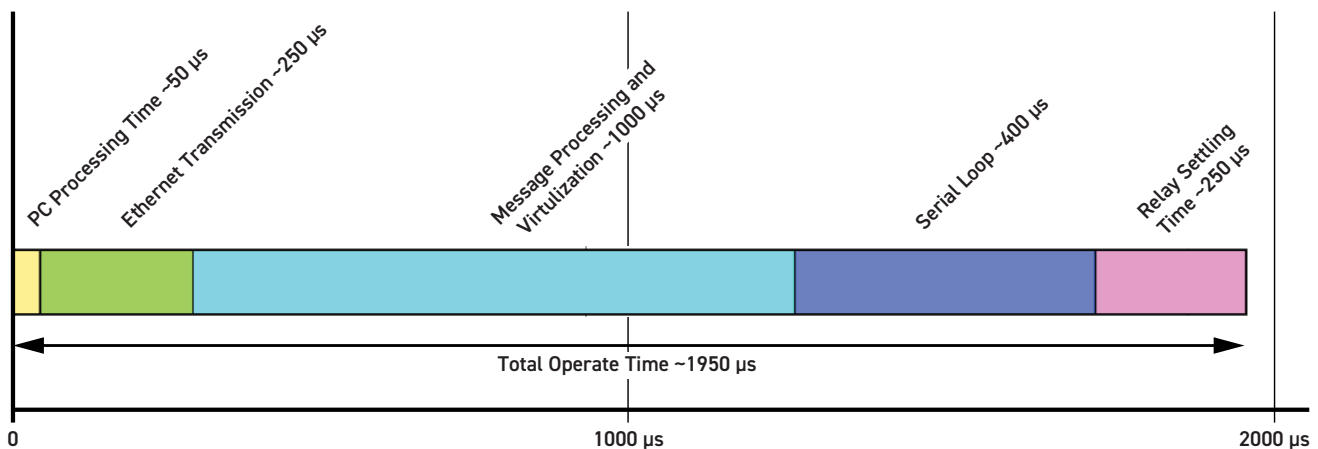
This unit features a software reset line which provides the ability for a user supplied reset to be applied to the unit, triggering a software reset of the relays, returning all relays in the unit to their default state. There is also a software fault line available that will be triggered if there is any error detected within the unit. Please note that while these reset and fault lines use dedicated physical connections to the unit, they are software control lines and as such should not be used for safety interlocks etc.

### Speed of Operation

Speed of Operation can be important when defining systems for test applications, therefore it can be beneficial to understand all the necessary overhead delays associated with a switch operation.

If we consider a single relay / block relay operation, it can be considered to be a combination of five discrete operations: PC Processing, Ethernet Latency, LXI Processing / Virtualisation, Serial Loop Transmission and Relay Settling.

A representation of these processes can be seen in the diagram below.



**Example Speed of Operation Diagram For Reed Relay Based Solution**  
**Note: These are estimated figures, PC processing and Ethernet transmission times may vary depending upon the overall system setup and load.**

## Connectivity Solutions

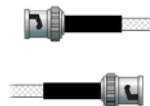
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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



Connectors & Backshells



Multiway 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](http://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](http://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](http://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
- **Marvin** ATEasy
- **MTQ Testsolutions** Tecap Test & Measurement Suite

As well as various open source environments such as:

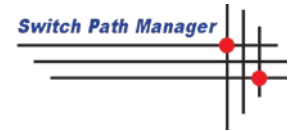
- **Sharp Develop**
- **Dev-C++**

To learn more about software drivers and development environments, please go to: [pickeringtest.com/software](http://pickeringtest.com/software)



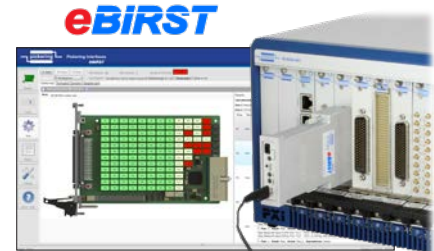
## Signal Routing Software

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](http://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](http://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](http://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](http://pickeringtest.com/resources)