

- 16x4, 16x2 & 8x4 RF Coaxial Matrices
- 300 MHz Usable Bandwidth
- 50  $\Omega$  & 75  $\Omega$  Versions Available
- Easy to Use Loop Thru Option Allows Unlimited X Axis Expansion
- High Density SMB & Multiway Connector Versions
- 75  $\Omega$  Version Suitable for Telecoms & Video Switching
- VISA & IVI Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- Selected Builds Supported by *eBIRST*™
- 3 Year Warranty



40-727/728/729 are RF matrix modules suitable for switching frequencies up to 300 MHz. They are available in 50  $\Omega$  or 75  $\Omega$  versions front panel SMB coaxial connectors. The modules provide a simple and scalable bidirectional matrix for RF frequencies and are intended for the easy construction of high performance matrix switching systems.

All X and Y connections have isolation switches. These can be used to disconnect the matrix from the external test fixture to maximize isolation and RF performance.

## Matrix Operation

The 40-727/8/9 are high density matrices designed to provide a Y to X connection to maximize bandwidth. They can also support limited X to X connectivity as shown in the manual.

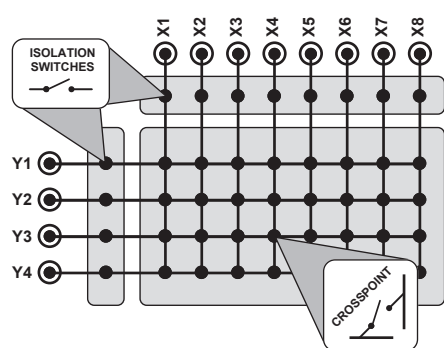
These modules are based on the same construction as the popular 40-725 RF matrix, but has increased capacity and optional Y axis loop thru allowing easy expansion with a minimum loss of bandwidth.

Other RF Matrix Modules in Pickering's PXI Range:	
40-725	8x9 500 MHz, 50 $\Omega$ /75 $\Omega$
40-726A	12x8 300 MHz, 50 $\Omega$ /75 $\Omega$ - Optional Y Loop-Thru
40-750	8x2 1.5 GHz, 50 $\Omega$ /75 $\Omega$ - Y Loop-Thru
40-872	Single/dual 2x2 3 GHz, 50 $\Omega$
40-832	Single/dual 2x2 3 GHz, 75 $\Omega$
45-720A	6U, 16x16 250 MHz, 50 $\Omega$ /75 $\Omega$ - Y Loop-Thru
Alternative LXI Ethernet Controlled RF Matrices:	
60-760	Single/Dual 24x8 25 MHz, 50 $\Omega$
60-711	Single/Dual 24x8 25 MHz, 75 $\Omega$
60-110	Scalable 24x8 to 104x16 200 MHz, 50 $\Omega$

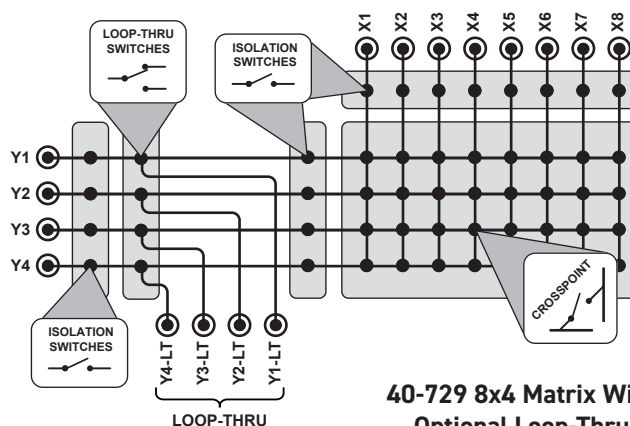
## Supported by *eBIRST*

50  $\Omega$  SMB versions without loop-thru are supported by *eBIRST* switching system test tools. These simplify switching system fault-finding by quickly testing the system and graphically identifying the faulty relay.

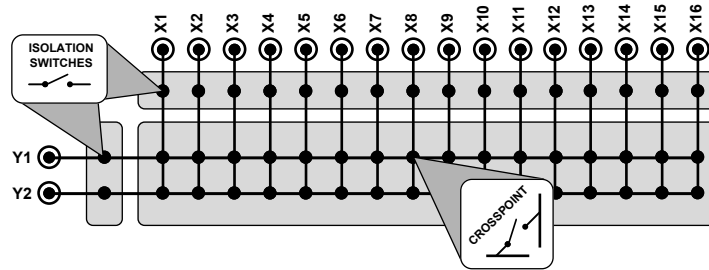
For more information go to: [pickeringtest.com/ebirst](http://pickeringtest.com/ebirst)



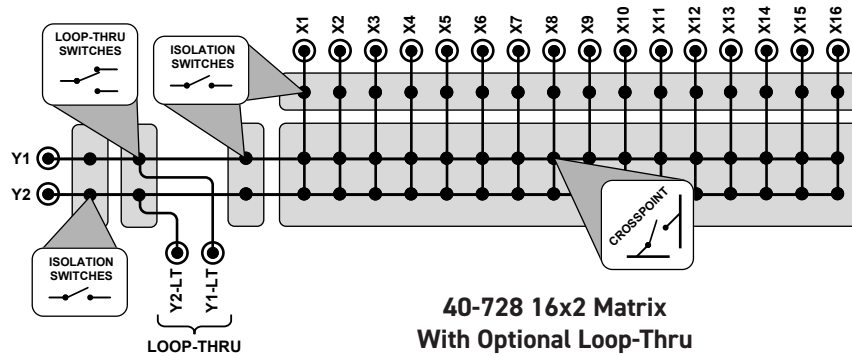
40-729 8x4 Matrix Without Loop-Thru



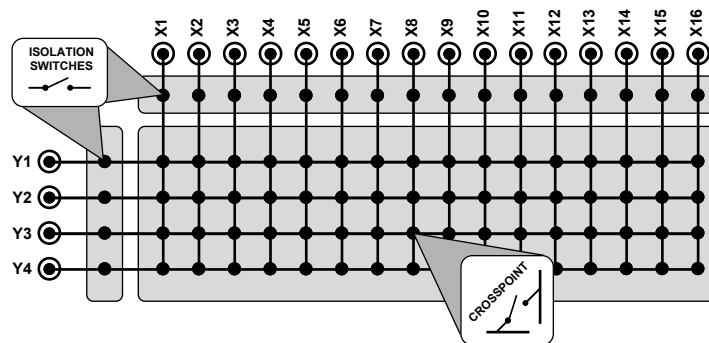
40-729 8x4 Matrix With Optional Loop-Thru



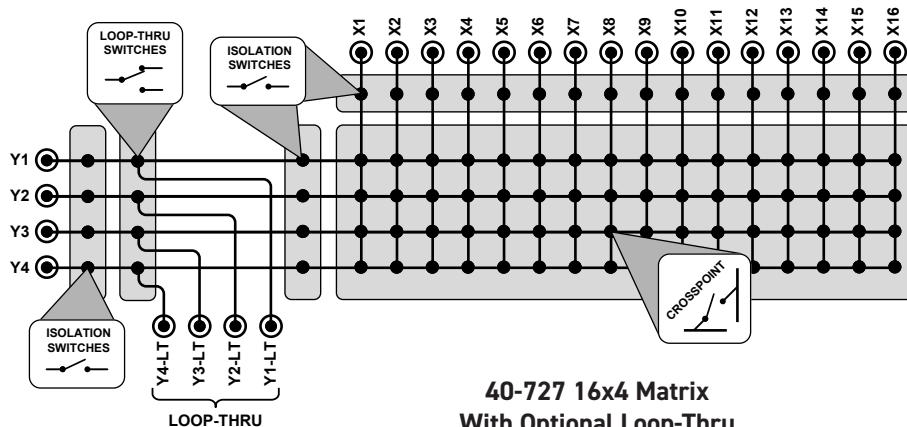
**40-728 16x2 Matrix Without Loop-Thru**



**40-728 16x2 Matrix With Optional Loop-Thru**



**40-727 16x4 Matrix Without Loop-Thru**



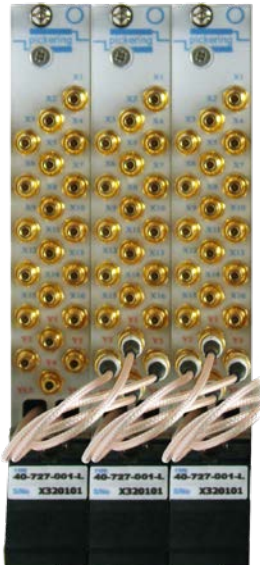
**40-727 16x4 Matrix With Optional Loop-Thru**

## Y Axis Loop Thru Option

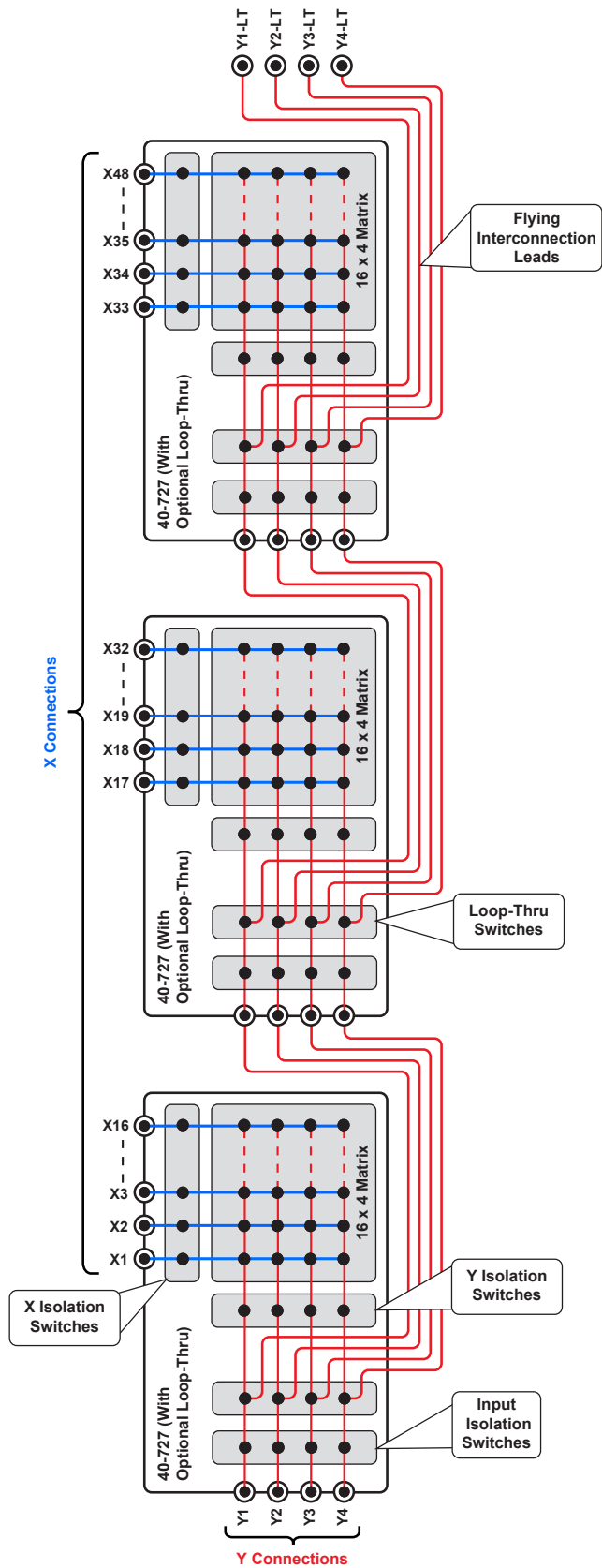
The easy to use loop thru option allows 40-727/728/729 modules to be cascaded to form larger matrices whilst minimizing impact on RF performance.

The versions with SMB connectors have built in Y loop-thru cables fitted to the front panel which are simply plugged into the Y connectors of the adjacent matrix module. Multiway connector versions include pins for loop-thru on the front panel connector.

The loop thru system is designed to provide an extended connection from Y to X, it does not support an X to X connection where the X connections are in different modules.



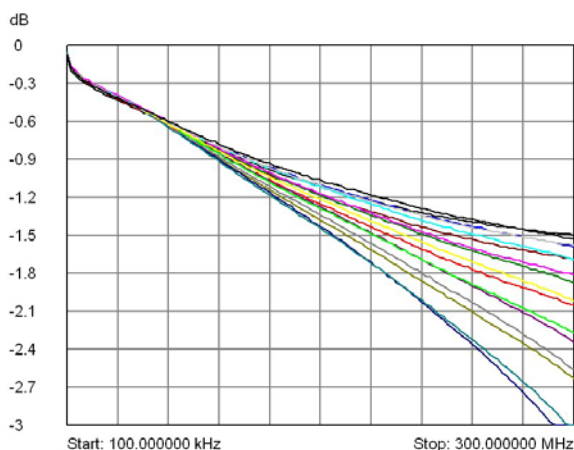
**48x4 RF Matrix Created from  
3-off 40-727-001-L  
(Loop-Thru cables  
interconnect each 16x4  
Matrix module)**



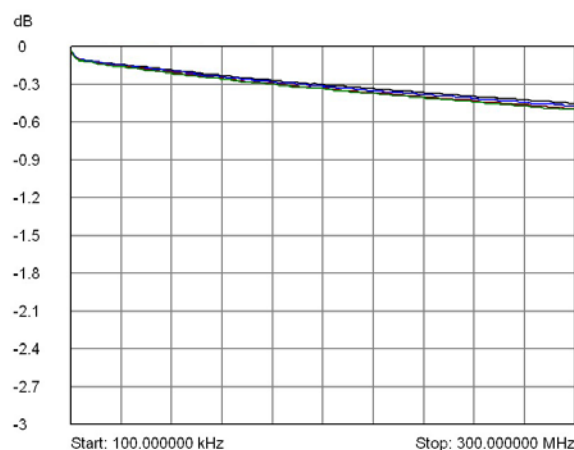
**3 off 40-727-001-L 16x4 RF Matrix Modules  
Interconnected as a 48x4 Matrix**

## RF Performance Plots for 40-727 300 MHz RF Matrix Module

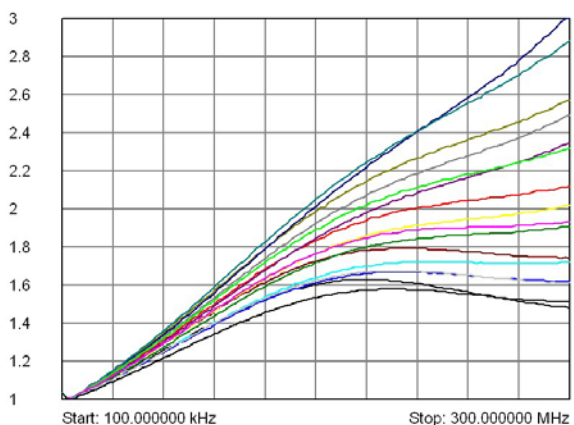
Typical curves are shown for matrix rows/columns with 1 crosspoint set. For optimum insertion loss and VSWR, ensure only one crosspoint is set in any one row/column. **Multiple crosspoints can be set on one row or column but this will seriously degrade RF performance.** Performance is also dependent upon the area of the matrix where the crosspoint is set. Best performance is obtained at the corners (for example X1-Y1), worse performance is obtained in the center (X8-Y2). This is outlined in the insertion loss and VSWR plots which also include the performance of a typical signal path between X4 and Y2. For more information on how performance is distributed throughout the matrix, please refer to the user manual.



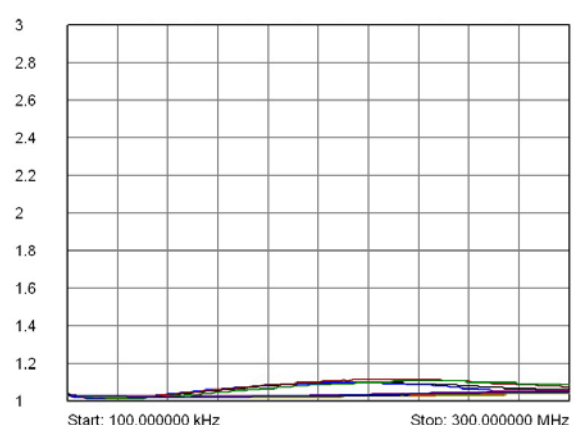
**40-727 50 Ω Insertion Loss For X to Y Signal Paths**



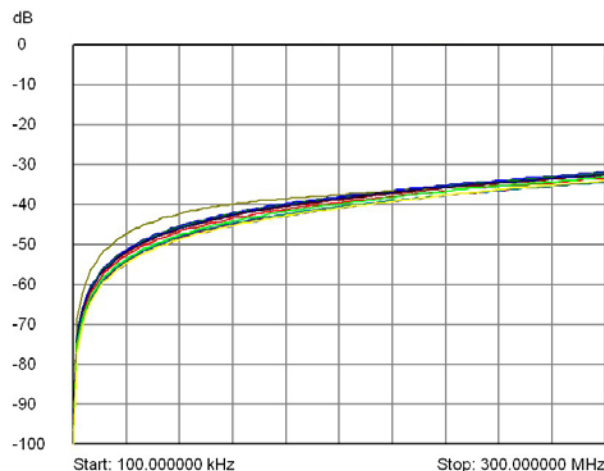
**40-727 50 Ω Insertion Loss For Y Loop-Thru Paths**



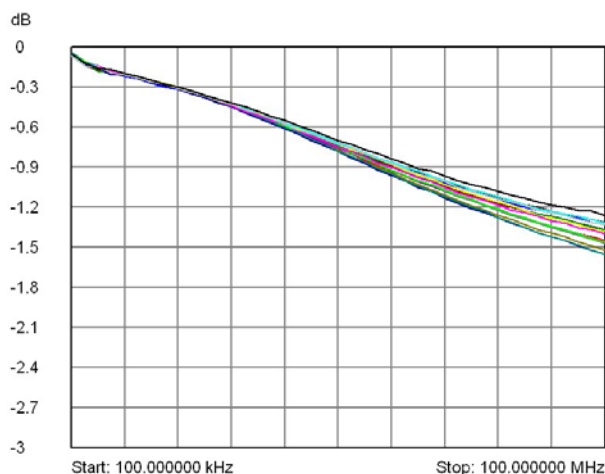
**40-727 50 Ω VSWR For X to Y Signal Paths**



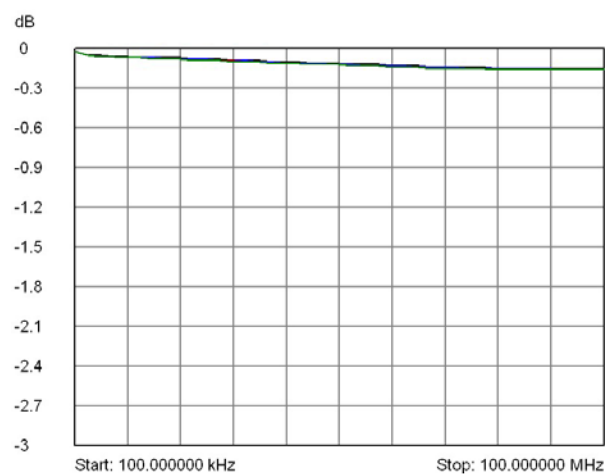
**40-727 50 Ω Loop-Thru Paths VSWR**



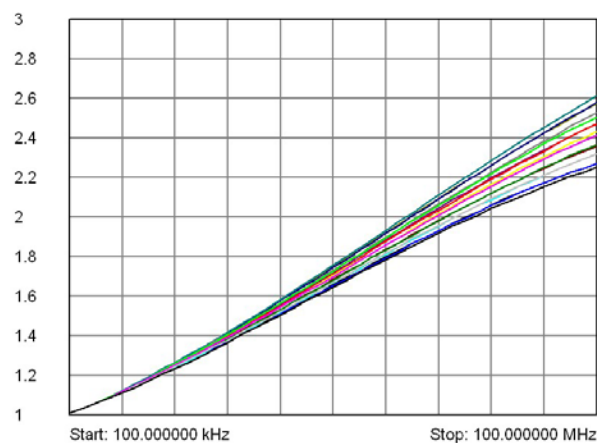
**40-727 50 Ω Crosstalk Between Signal Paths**



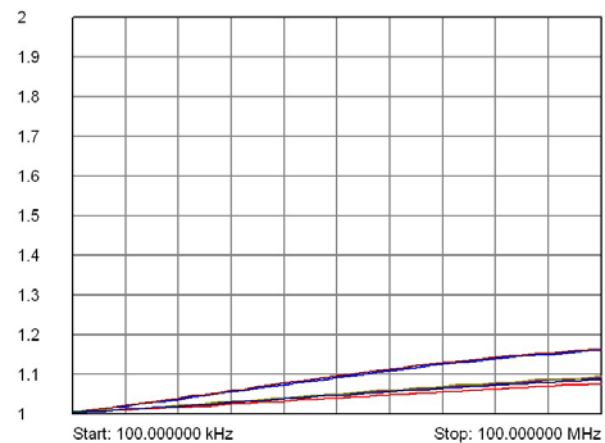
**40-727 75  $\Omega$  Insertion Loss For X to Y Signal Paths**



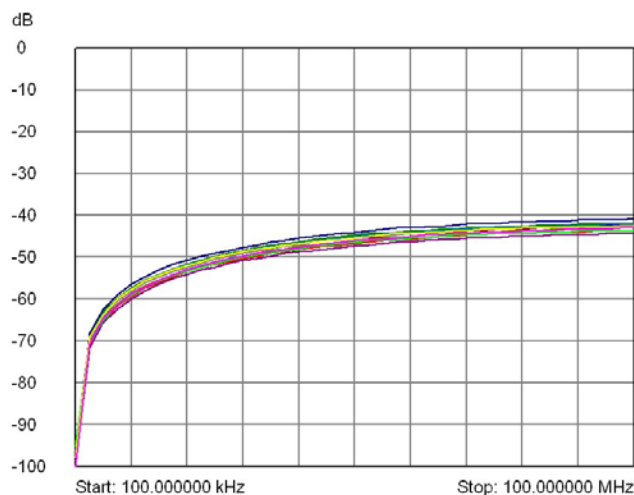
**40-727 75  $\Omega$  Insertion Loss For Y Loop-Thru Paths**



**40-727 75  $\Omega$  VSWR For X to Y Signal Paths**



**40-727 75  $\Omega$  Loop-Thru Paths VSWR**



**40-727 75  $\Omega$  Crosstalk Between Signal Paths**

## Relay Type

The 40-727/728/729 is fitted with a mix of ruthenium sputtered reed relays and electro-mechanical relays. A spare reed relay is built onto the circuit board to allow easy maintenance with minimum downtime.

All reed relays are manufactured by our sister company Pickering Electronics: [pickeringrelay.com](http://pickeringrelay.com)

## General Matrix Switching Specification

Maximum Switch Voltage:	100 V
Maximum Switch Current:	0.5 A
Maximum Switch Power:	10 W
Characteristic Impedance:	50 $\Omega$ or 75 $\Omega$
On Path Resistance:	<1000 m $\Omega$
Off Path Resistance:	>10 <sup>8</sup> $\Omega$
Expected Life - Matrix:	1x10 <sup>9</sup> operations
Expected Life - Loop-Thru:	1x10 <sup>7</sup> operations
Operate Time:	5 ms typical
Release Time:	5 ms typical

## RF Specification

Maximum Frequency:	Usable to 300 MHz, 50 $\Omega$ Usable to 100 MHz, 75 $\Omega$
Insertion Loss (typical):	<3 dB for 50 $\Omega$ at 300 MHz† <3 dB for 75 $\Omega$ at 150 MHz†
V.S.W.R. (typical):	<2.0 for 50 $\Omega$ at 150 MHz† <2.0 for 75 $\Omega$ at 60 MHz†
Crosstalk (typical):	>45 dB at 50 MHz
Isolation (typical):	Better than 70 dB

## Loop Thru RF Specification

Insertion Loss:	0.6dB typical at 300 MHz
Isolation:	>70 dB
Operate Time:	5 ms typical
Release Time:	5 ms typical

† RF performance is entirely dependant upon the combination of crosspoints selected, the figures shown are for one selected crosspoint on any X or Y channel only, refer to graphs. For further assistance on getting maximum performance from the 40-727/728/729 please refer to the operating manual.

## Power Requirements

+3.3V	+5V	+12V	-12V
0	500 mA (typ 350 mA)	0	0

## Mechanical Characteristics

Single slot 3 U 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 front panel connectors:

- 40-727 SMB versions: X and Y Signals via 20 front panel mounted coaxial connectors (Y loop-thru via 4 flying leads).
- 40-728 SMB versions: X and Y Signals via 18 front panel mounted coaxial connectors (Y loop-thru via 2 flying leads).
- 40-729 SMB versions: X and Y Signals via 12 front panel mounted coaxial connectors (Y loop-thru via 4 flying leads).
- 40-727/728/729 Multiway versions: X, Y and Y loop-thru signals via one 26-pin high density MS-M RF multiway coaxial connector.

## 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 and 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

### PXI 16x4 RF Coaxial Matrix:

SMB 50 $\Omega$	40-727-001
SMB 50 $\Omega$ with loop-thru on Y axis	40-727-001-L
Multiway 50 $\Omega$	40-727-002
Multiway with loop-thru on Y axis	40-727-002-L
SMB 75 $\Omega$	40-727-101
SMB 75 $\Omega$ with loop-thru on Y axis	40-727-101-L

### PXI 16x2 RF Coaxial Matrix:

SMB 50 $\Omega$	40-728-001
SMB 50 $\Omega$ with loop-thru on Y axis	40-728-001-L
Multiway 50 $\Omega$	40-728-002
Multiway with loop-thru on Y axis	40-728-002-L
SMB 75 $\Omega$	40-728-101
SMB 75 $\Omega$ with loop-thru on Y axis	40-728-101-L

### PXI 8x4 RF Coaxial Matrix:

SMB 50 $\Omega$	40-729-001
SMB 50 $\Omega$ with loop-thru on Y axis	40-729-001-L
Multiway 50 $\Omega$	40-729-002
Multiway with loop-thru on Y axis	40-729-002-L
SMB 75 $\Omega$	40-729-101
SMB 75 $\Omega$ with loop-thru on Y axis	40-729-101-L

## Custom Configuration

### PXI 16x4 RF Coaxial Matrix:

SMB 50 $\Omega$ with twinax loop-thru ports on Y axis	40-727-901-L
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## 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.

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

40-727-001, 40-728-001 and 40-729-001 are 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](http://pickeringtest.com/ebirst)

Product	Test Tool	Adaptor
40-727-001	93-005-001	93-005-202A
40-728-001	93-005-001	93-005-202A
40-729-001	93-005-001	93-005-202A

Other Products Not Supported

## Mating Connectors & Cabling

For connection accessories for the SMB versions of the 40-727/728/729 range please refer to the [90-011D](#) RF Cable Assemblies data sheet or for the 26-pin MS-M connector versions, please refer to the [90-017D](#) 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

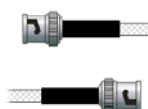
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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

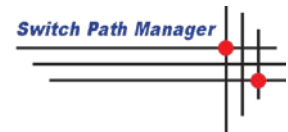
- **Pickering Interfaces Switch Path Manager**
- **National Instruments** products (LabVIEW, LabWindows/CVI, Switch Executive, MAX, TestStand, VeriStand, etc.)
- **Microsoft Visual Studio** products (Visual Basic, Visual C++)
- **Keysight** VEE and OpenTAP
- **Mathworks** Matlab
- **Marvin** ATEasy
-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

## Signal Routing Software

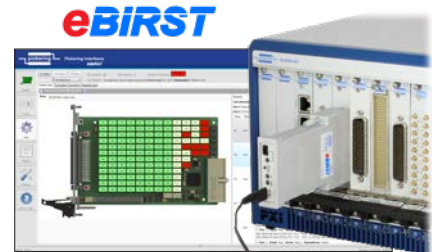
Our signal routing software, Switch Path Manager, automatically selects and energizes switch paths through Pickering switching systems. Signal routing is performed by simply defining test system endpoints to be connected together, greatly accelerating Test System software development. To learn more, 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)