

# PXI/PXIe 12x8 RF Matrix Module

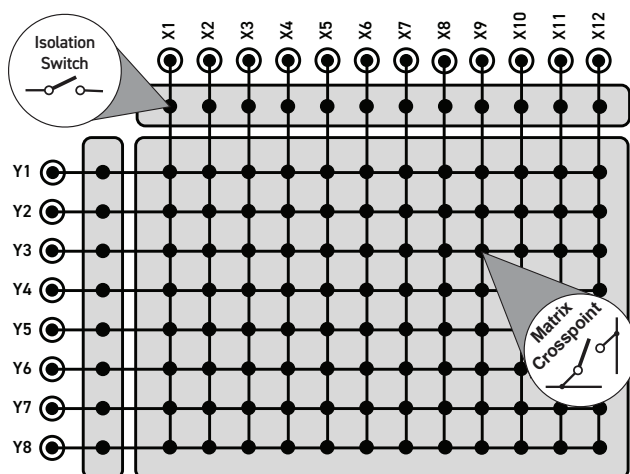
40/42-726B

- Available as PXI or PXIe Modules
- 12x8 RF Coaxial Matrix
- Up to 300 MHz Bandwidth
- 50  $\Omega$  and 75  $\Omega$  Versions Available
- Easy to Use Loop-thru Options, Enabling Simple Expansion Via Built-In Cabling With No Hidden Expense
- High Density SMB Coaxial Connectors
- 75  $\Omega$  Version Suitable for Telecoms & High Quality Video
- Relay Cycle Counting Included
- Drivers Supplied for Windows & Linux, Plus Support for Real-time Systems
- PXI Versions Supported by PXI or LXI Chassis
- Selected Builds Supported by **eBIRST™**
- 3 Year Warranty



The 40-726B (PXI) and 42-726B (PXIe) 12x8 RF matrix modules are suitable for switching frequencies up to 300 MHz. They are available in either 50  $\Omega$  or 75  $\Omega$  versions with front panel SMB coaxial connectors. The module provides a simple and scalable bidirectional matrix for RF frequencies and is intended for the easy construction of high performance 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.



12x8 RF Matrix Simplified Schematic Diagram for 40/42-726B

## Matrix Operation

The 40/42-726B is a true 12x8 high density matrix, any combination of crosspoints may be selected. Only the signal is switched, all grounds are common.

This module is based on the same construction as the popular 40-725 RF matrix module, but has increased capacity and optional built in loop thru on the Y axis to allowing easy expansion with a minimum loss of bandwidth.

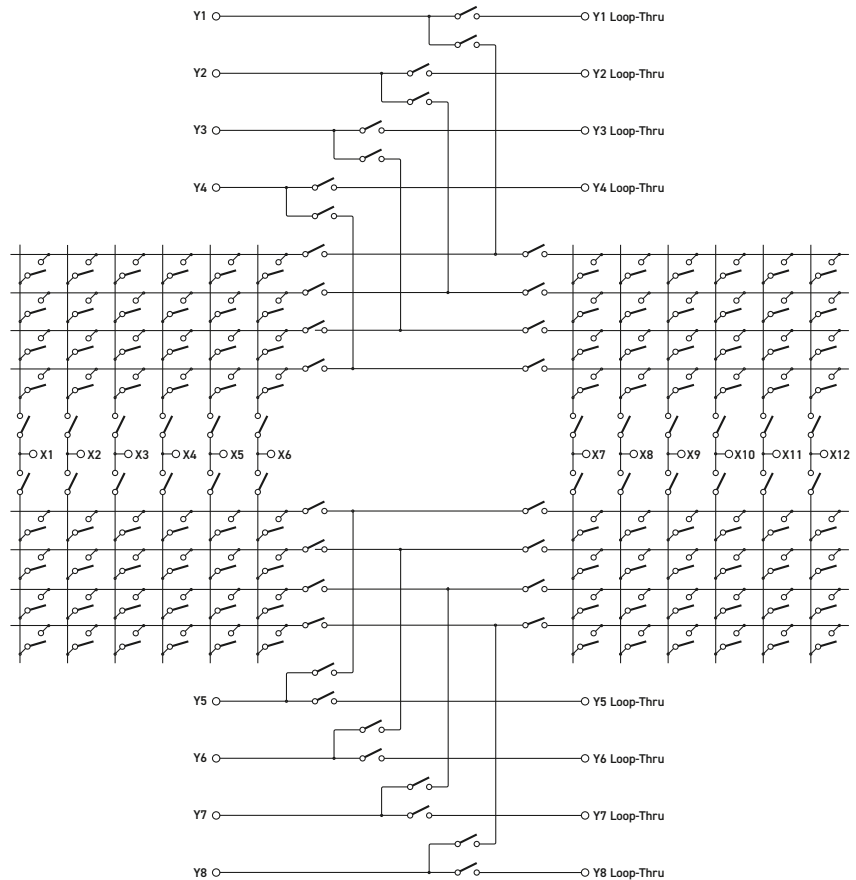
## Supported by eBIRST

The 50  $\Omega$  non-loop thru version of the 40/42-726B is supported by eBIRST test tools. These simplify 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)

## Updated Product Information

This product has been introduced as a “form & fit” update to the 40-726A, the changes are to provide PXIe options and an updated bus interface which will require the use of an updated software driver. Otherwise, the electrical performance is very similar and the software and pinout are identical.

## Switching Architecture



Switching Diagram for the 12x8 RF Matrix Module with Optional Loop-thru  
- Part Number 40/42-726B-511-L (see user manual for details)

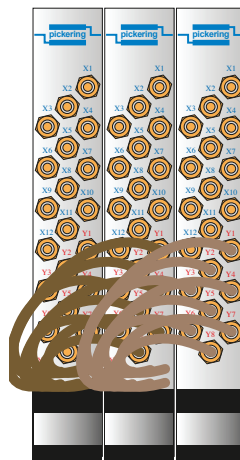
## Relay Cycle Counting

To aid with module “health” monitoring all versions are provided with a relay cycle counting feature. The number of operations per contact are stored on the module and can be used to determine if a relay is approaching EOL. This information could allow system connections to be revised so that signals applied to heavily used contacts are swapped with lightly used contacts to prolong the working life of the relay(s).

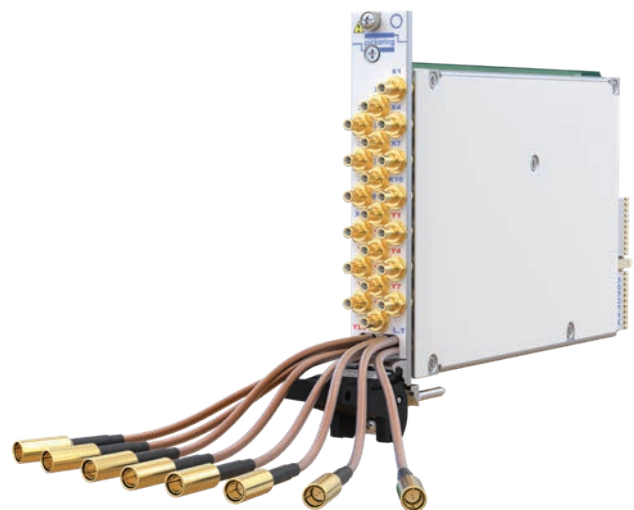
## Y Axis Loop Thru Option

The easy to use loop thru option allows 40/42-726B modules to be cascaded to form larger matrices whilst minimizing impact on RF performance, for example 8 modules can be used to construct a 96x8 matrix with bandwidth preserved at over 200 MHz.

These versions 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.



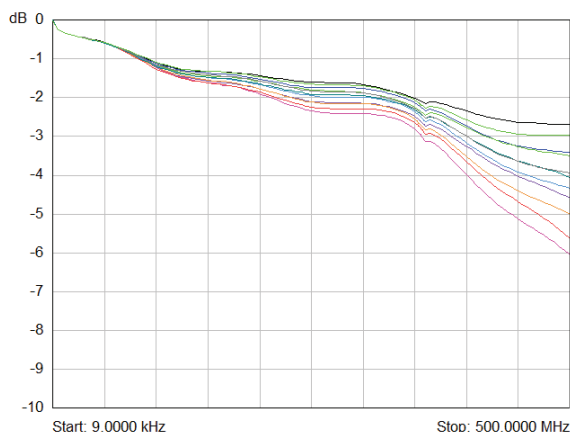
Construction of a 36x8 RF Matrix (Loop-Thru cables interconnect each 12x8 Matrix module)



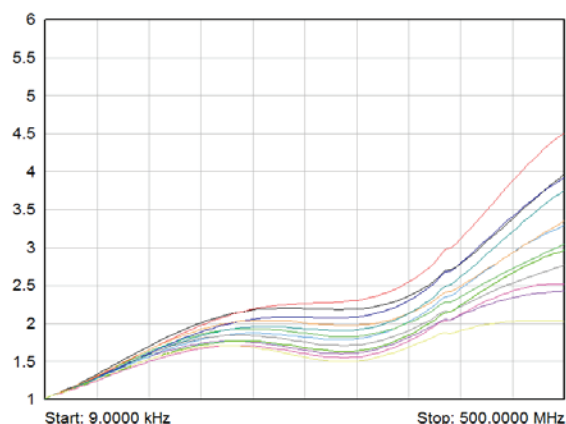
PXI Version of 12x8 Matrix with Optional Loop-thru  
- Part Number 40-726B-511-L

## RF Performance Plots for 40/42-726B RF Matrix Module

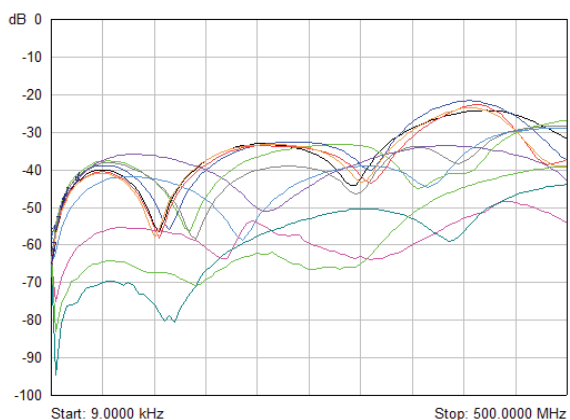
Typical curves are shown for matrix rows/columns with 1 crosspoint set. For optimum insertion loss and VSWR, ensure only one crosspoint is set in any one row/column. Multiple crosspoints can be set on one row or column but this will seriously degrade RF performance. Performance is also dependent upon the area of the matrix where the crosspoint is set. Best performance is at the corners (for example X1-Y1), worse performance is in the center (X6-Y4). This is outlined in the insertion loss and VSWR plots which include the performance of a typical signal path between X3 and Y3. For more information on how performance is distributed throughout the matrix, please refer to the user manual.



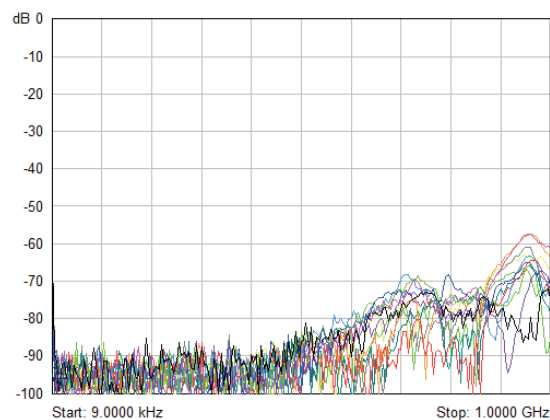
**40/42-726B-511-L (50 Ω Version) Insertion Loss to 500 MHz**



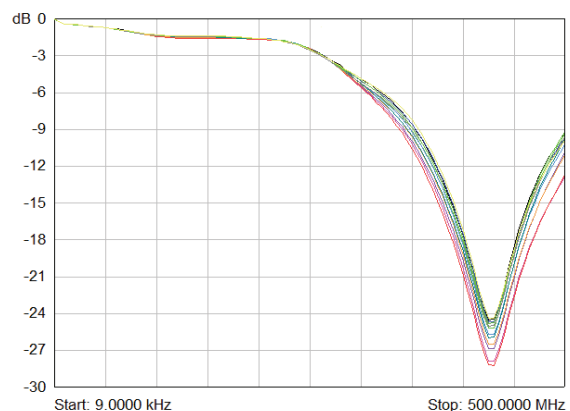
**40/42-726B-511-L (50 Ω Version) VSWR Plot to 500 MHz**



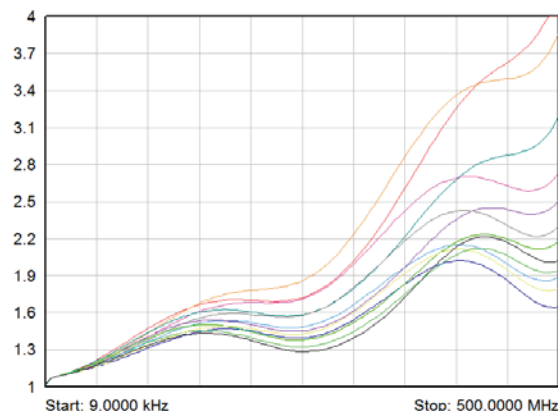
**40/42-726B-511-L (50 Ω) Crosstalk to 500 MHz**



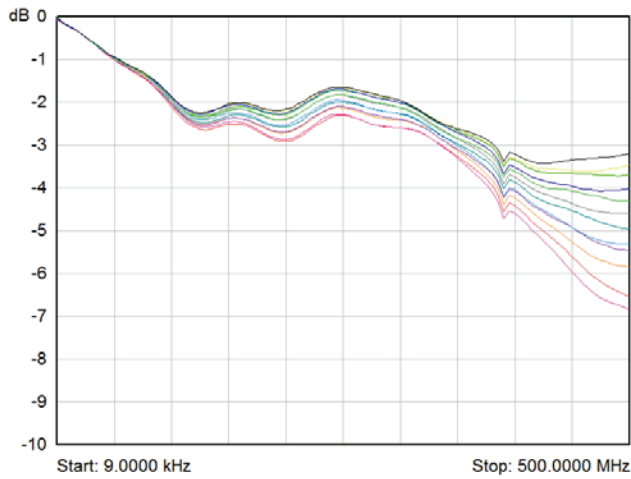
**40/42-726B-511-L (50 Ω) Isolation to 1 GHz**



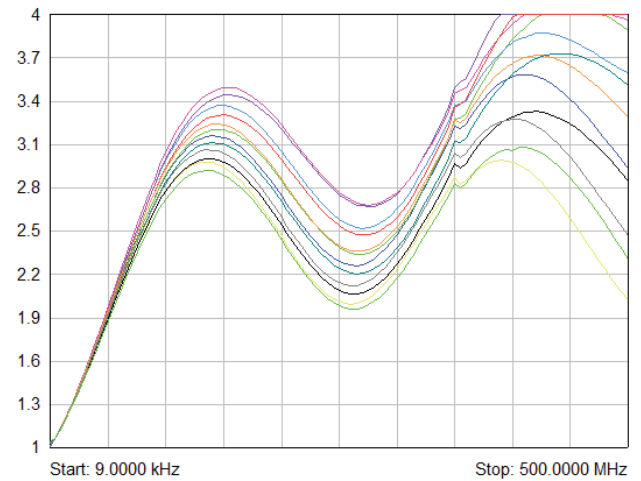
**40/42-726B-511-L (50 Ω) Loop-Thru Insertion Loss to 500 MHz**



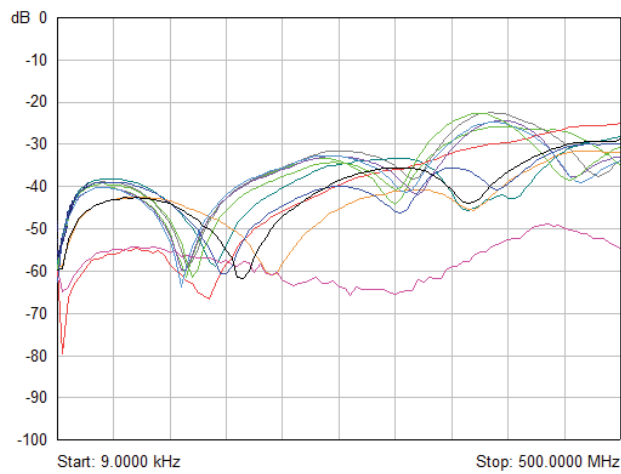
**40/42-726B-511-L (50 Ω) Loop-Thru VSWR to 500 MHz**



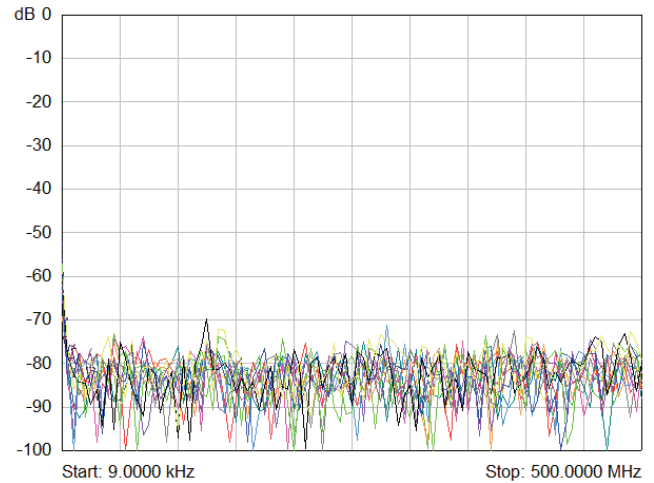
**40/42-726B-751-L (75 Ω) Insertion Loss to 500 MHz**



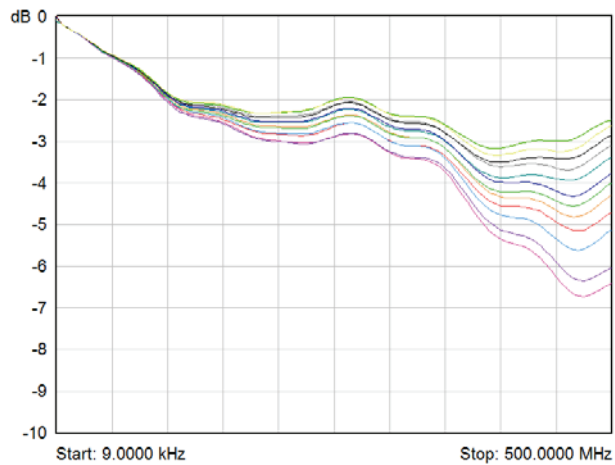
**40/42-726B-751-L (75 Ω) VSWR to 500 MHz**



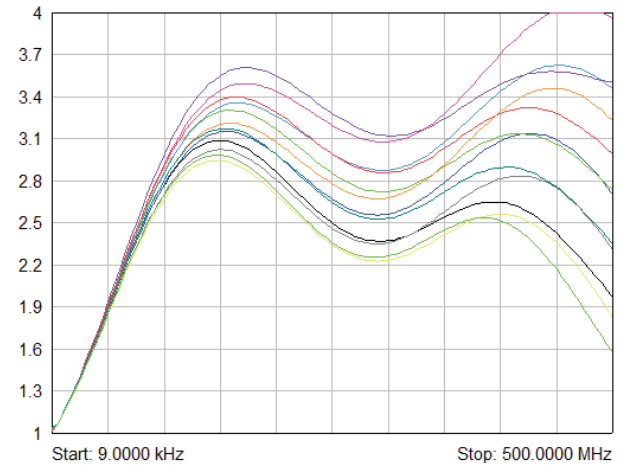
**40/42-726B-751-L (75 Ω) Crosstalk to 500 MHz**



**40/42-726B-751-L (75 Ω) Isolation to 500 MHz**



**40/42-726B-751-L (75 Ω) Loop-Thru Insertion Loss to 500 MHz**



**40/42-726B-751-L (75 Ω) Loop-Thru VSWR to 500 MHz**

## Relay Type

The 40/42-726B RF matrix is fitted with ruthenium sputtered reed relays, these offer very stable switch contact resistance with expected life of  $10^9$  operations when switching typical RF signals. All reed relays are manufactured by our Relay Division: [pickeringrelay.com](http://pickeringrelay.com)

## General Switching Specification

|                                      |                               |
|--------------------------------------|-------------------------------|
| Maximum Voltage:                     | 100 VDC                       |
| Maximum Power:                       | 10 W                          |
| Maximum Switch Current:              | 0.5 A                         |
| Maximum Carry Current:               | 0.5 A                         |
| Characteristic Impedance:            | 50 $\Omega$ or 75 $\Omega$    |
| Initial On Path Resistance:          | <1000 m $\Omega$              |
| Off Path Resistance:                 | >10 <sup>8</sup> $\Omega$     |
| Thermal Offset:                      | <70 $\mu$ V                   |
| Maximum Simultaneous Relay Closures: | 100                           |
| Expected Life (Low Power):           | 1x10 <sup>9</sup> operations  |
| Expected Life (Max Power):           | >5x10 <sup>6</sup> operations |
| Operate Time:                        | <1 ms, 0.5 ms typical         |

## Power Requirements - 40-726B

|                  |                     |       |       |
|------------------|---------------------|-------|-------|
| +3.3 V           | +5 V                | +12 V | -12 V |
| 0.16 A (typical) | 2.06 A (100 relays) | 0     | 0     |

## Power Requirements - 42-726B

|                  |                     |
|------------------|---------------------|
| +3.3 V           | +12 V               |
| 0.41 A (typical) | 1.09 A (100 relays) |

## RF Specification - 50 $\Omega$ Version

|                        |                                                                                 |
|------------------------|---------------------------------------------------------------------------------|
| Bandwidth:             | 300 MHz (typical)                                                               |
| Bandwidth - Loop-thru: | 250 MHz (typical)                                                               |
| Typical Rise Time:     | 800 ps †                                                                        |
| Insertion Loss:        | <3 dB to 300 MHz †                                                              |
| VSWR:                  | 2.4:1 (typical) to 300 MHz †                                                    |
| Crosstalk:             | <35 dB at 50 MHz<br><35 dB at 100 MHz<br><30 dB at 250 MHz<br><30 dB at 300 MHz |
| Isolation:             | <70 dB up to 300 MHz                                                            |

## RF Specification - 75 $\Omega$ Version

|                        |                                                                                 |
|------------------------|---------------------------------------------------------------------------------|
| Bandwidth:             | 300 MHz (typical)                                                               |
| Bandwidth - Loop-thru: | 225 MHz (typical)                                                               |
| Typical Rise Time:     | 800 ps †                                                                        |
| Insertion Loss:        | <3 dB to 250 MHz †                                                              |
| VSWR:                  | 3.7:1 (typical) to 100 MHz †                                                    |
| Crosstalk:             | <40 dB at 50 MHz<br><40 dB at 100 MHz<br><30 dB at 250 MHz<br><30 dB at 300 MHz |
| Isolation:             | <70 dB up to 300 MHz                                                            |

† 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 40/42-726B, please refer to the user manual.

## Mechanical Characteristics

40-726B - Single slot 3U PXI (CompactPCI card).

42-726B - Single slot 3U PXIe, compatible with PXIe hybrid slot.

Module weight: 430 g

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

## Connectors

40-726B - PXI bus via 32-bit P1/J1 backplane connector.

42-726B - PXIe bus via XJ3 and XJ4 backplane connectors.

X and Y Signals via 20 front panel mounted coaxial SMB connectors.

Versions with -L suffix have Y signal loop-thru via 8 off SMB flying leads with a nominal length of 120 mm.

A clearance of 80 mm from the front panel of the module is required for routing the leads to an adjacent module.



PXIe Version of 12x8 Matrix with Optional Loop-thru  
- Part Number 42-726B-511-L

## PXI & CompactPCI Compliance - 40-726B

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 - 42-726B

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/Transport Temperature: -20 °C to +75 °C

Humidity: Up to 90 % non-condensing

Altitude: 15000 m



Optional Y-axis loop-thru allows easy expansion. Shown here is a 60x8 RF matrix with over 200 MHz bandwidth.

## Product Order Codes

|                                           |               |
|-------------------------------------------|---------------|
| PXI 12x8 RF Coaxial Matrix:               |               |
| SMB, 50 $\Omega$                          | 40-726B-511   |
| SMB, 50 $\Omega$ with loop-thru on Y axis | 40-726B-511-L |
| SMB, 75 $\Omega$                          | 40-726B-751   |
| SMB, 75 $\Omega$ with loop-thru on Y axis | 40-726B-751-L |
| PXIe 12x8 RF Coaxial Matrix:              |               |
| SMB, 50 $\Omega$                          | 42-726B-511   |
| SMB, 50 $\Omega$ with loop-thru on Y axis | 42-726B-511-L |
| SMB, 75 $\Omega$                          | 42-726B-751   |
| SMB, 75 $\Omega$ with loop-thru on Y axis | 42-726B-751-L |

## 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.

## Other RF Matrices in Pickering's PXI/PXIe Range

|            |                                                               |
|------------|---------------------------------------------------------------|
| 40-725     | 8x9 500 MHz, 50 $\Omega$ /75 $\Omega$                         |
| 40/42-727A | 16x4 300 MHz, 50 $\Omega$ /75 $\Omega$ - Optional Y Loop-Thru |
| 40/42-728A | 16x2 300 MHz, 50 $\Omega$ /75 $\Omega$ - Optional Y Loop-Thru |
| 40/42-729A | 8x4 300 MHz, 50 $\Omega$ /75 $\Omega$ - Optional Y Loop-Thru  |
| 40/42-750A | 8x2 1.5 GHz, 50 $\Omega$ /75 $\Omega$ - Y Loop-Thru           |
| 40/42-877A | Single/Dual 2x2 3 GHz, 50 $\Omega$ - X&Y Loop-Thru            |
| 40/42-837A | Single/Dual 2x2 3 GHz, 75 $\Omega$ - X&Y Loop-Thru            |
| 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 $\Omega$         |
| 65-110 | Scalable 24x8 to 104x16 200 MHz, 50 $\Omega$ |

## Support Products

### eBIRST Switching System Test Tool

40/42-726B-511 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](http://pickeringtest.com/ebirst)

| Product        | Test Tool  | Adaptor     |
|----------------|------------|-------------|
| 40/42-726B-511 | 93-005-001 | 93-005-202A |

### 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  |
|------------|------------|
| 40/42-726B | 91-100-004 |

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

### Mating Connectors & Cabling

For connection accessories for the 40/42-726B range please refer to the [90-011D](#) RF Cable Assemblies data sheet where a complete list and documentation can be found for accessories.

## 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

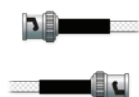
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with **1200+** products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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



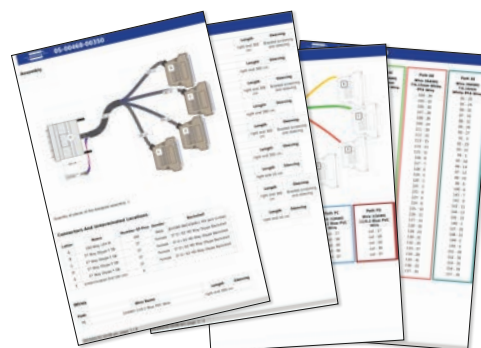
Breakouts



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

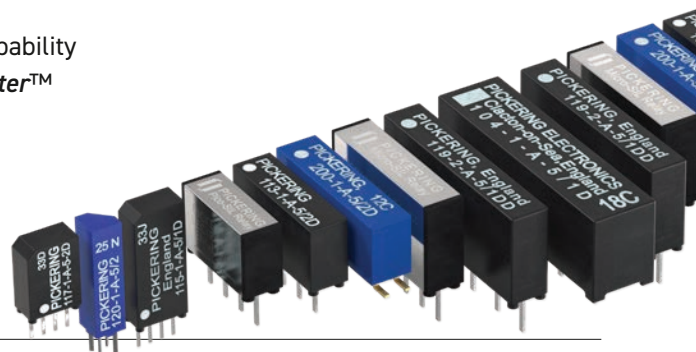
## Mass Interconnect

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](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 more information go to [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, Simulink**
- **Marvin ATEasy**
- **MTQ Testsolutions** Tecap Test & Measurement Suite

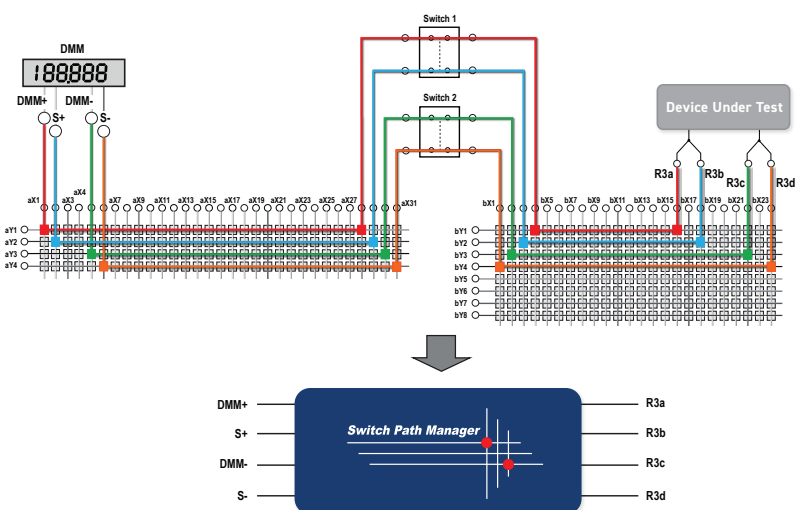
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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

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

