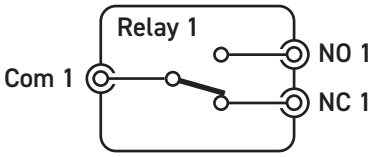
PXI/PXIe Microwave SPDT Relay Modules 4x-780B

- Available as PXI or PXIe Modules
- 1, 2, 3 or 4 SPDT Relays Per Module
- 1, 2 or 3 SPDT Relays From Remote Version
- 12.4 GHz, 18 GHz, 26.5 GHz, 40 GHz, 50 GHz & 67 GHz Bandwidth in 50 Ω
- 2.5 GHz Bandwidth in 75 Ω
- High Power N-Type Options
- Tree Networks may be Constructed by Inter-Linking Individual Modules
- Relay Cycle Counting Included
- LED Indication
- PXI Version Supported by PXI or LXI Chassis
- VISA, IVI & Kernel Drivers Supplied for Windows
- 3 Year Warranty



Microwave SPDT Switch (Part No. 4x-780B) in Single Relay Format

The 40-780B (PXI) and 42-780B (PXIe) Microwave switching modules consist of one, two, three or four SPDT switches capable of switching frequencies to 67 GHz in 50 Ω or 2.5 GHz in 75 Ω. Connections are made via front panel mounted high quality RF coaxial connectors, SMA/N-Type for 50 Ω and 1.6/5.6 in 75 Ω versions. Remote versions are also available which can support up to three SPDT relays in a single slot.

The remote versions, as well as occupying less panel space in the case of the triple options, allow the microwave relays to be placed closer to the UUT and RF test equipment. This can shorten the length of cables and improve system performance. Remote multiplexers are supplied with a 1.5 m interface cable.

Remote version controls 1, 2 or 3 remotely mounted SPDT microwave relays via interface cables

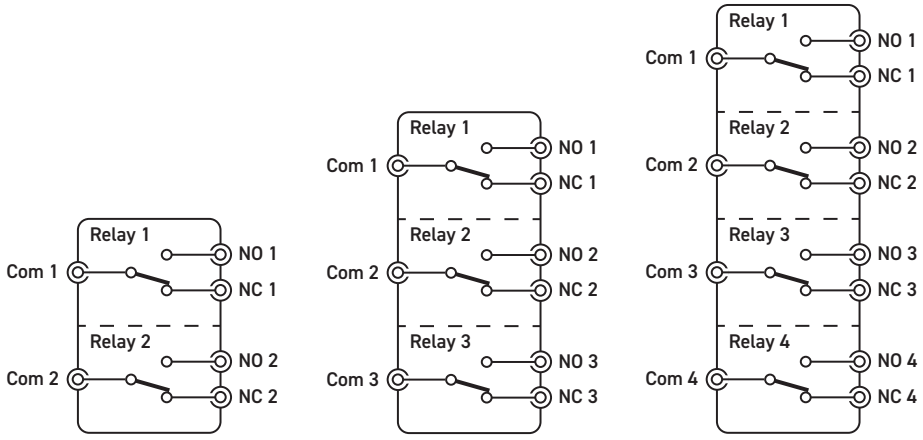
The 4x-780B range gives you the highest RF and microwave switching performance available within a Pickering switching system. Although designed for microwave applications, they have many uses in the RF spectrum where extremely low insertion loss and ultra high isolation are critical. They may also be used for lower frequency RF applications where power handling to 240 W is required (700 W for N-Type options).

Product Compatibility

The 4x-780B range has been introduced as an update to the existing 40-780A family. These remain orderable but the new 4x-780B is recommended as it provides additional options such as the PXIe control interface. The RF performance of the 4x-780B is identical to the 40-780A.

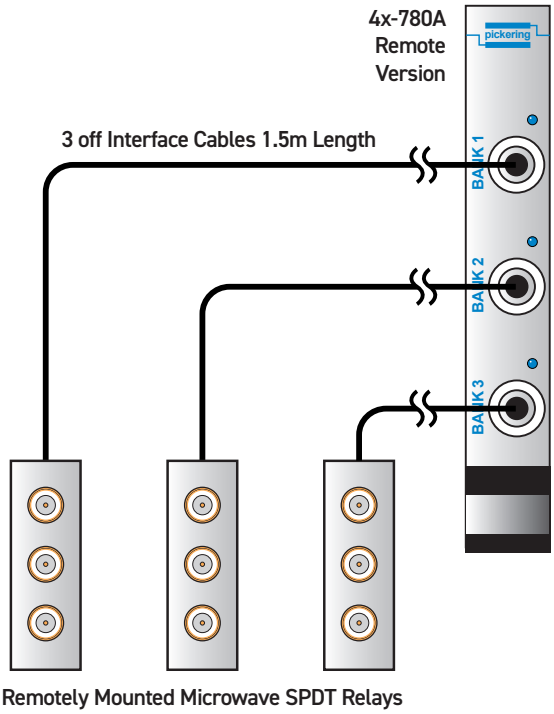
Relay Cycle Counting

To aid with module "health" monitoring all versions are provided with a relay cycle counting cycle 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).



Microwave SPDT Switch (Part No. 4x-780B) in Dual, Triple and Quad Relay Formats

Remotely Mounted Microwave Relay Versions

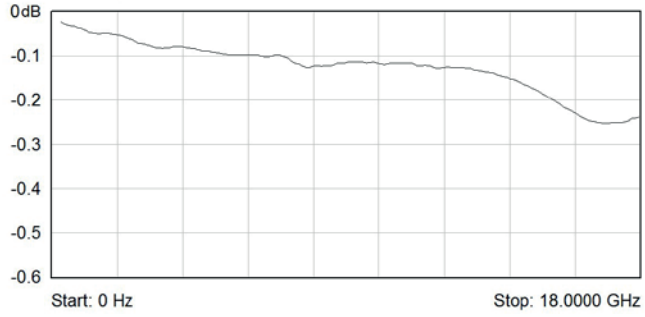


Interconnection Between 4x-780B Remote Version and Remotely Mounted Microwave Relays

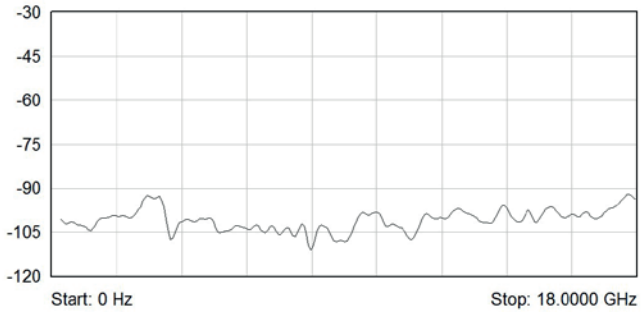
Microwave SPDT Relay & Cable for Remote Mounting

Specifications - 18 GHz & 26.5 GHz Versions

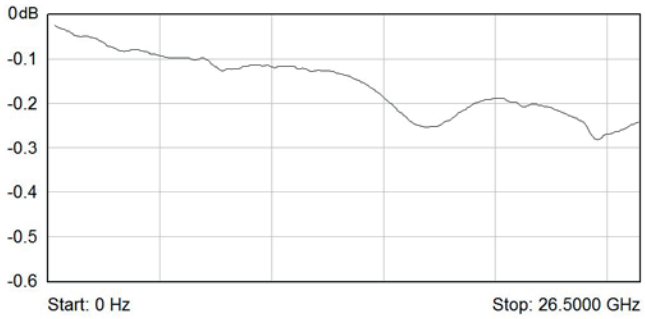
Connectors:	SMA
Insertion Loss:	<0.2 dB to 3 GHz
	<0.3 dB to 8 GHz
	<0.4 dB to 12.4 GHz
	<0.5 dB to 18 GHz
	<0.7 dB to 26.5 GHz (26.5 GHz versions only)
Isolation:	>80 dB to 3 GHz
	>70 dB to 8 GHz
	>60 dB to 18 GHz
	>55 dB to 26.5 GHz (26.5 GHz versions only)
VSWR:	<1.2:1 0 to 3 GHz
	<1.3:1 to 8 GHz
	<1.4:1 to 12.4 GHz
	<1.5:1 to 18 GHz
	<1.7:1 to 26.5 GHz (26.5 GHz versions only)
RF Average Carry Power at 25 °C:	240 W to 3 GHz
	150 W to 8 GHz
	120 W to 12.4 GHz
	100 W to 18 GHz
	40 W to 26.5 GHz (26.5 GHz versions only)



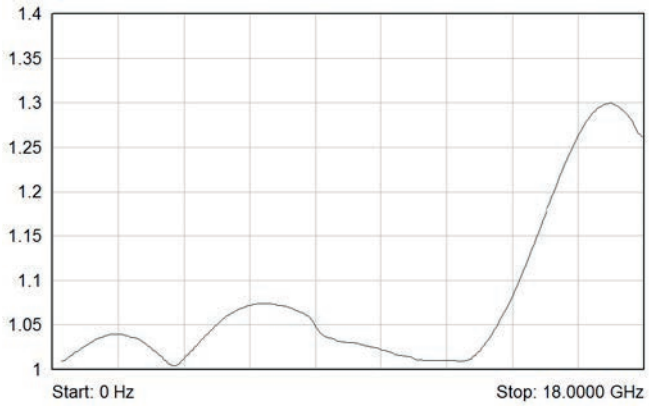
Typical Insertion Loss - 18 GHz Versions



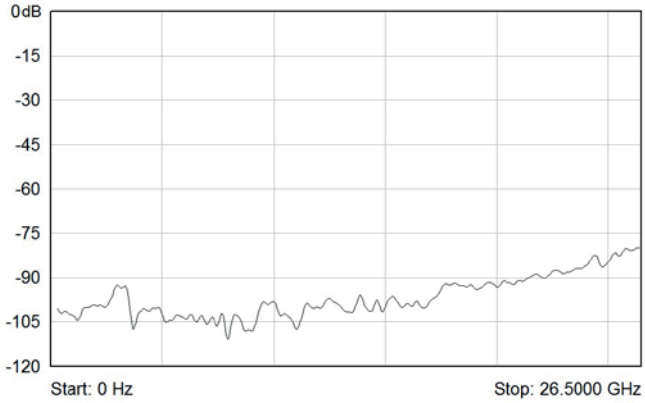
Typical Isolation - 18 GHz Versions



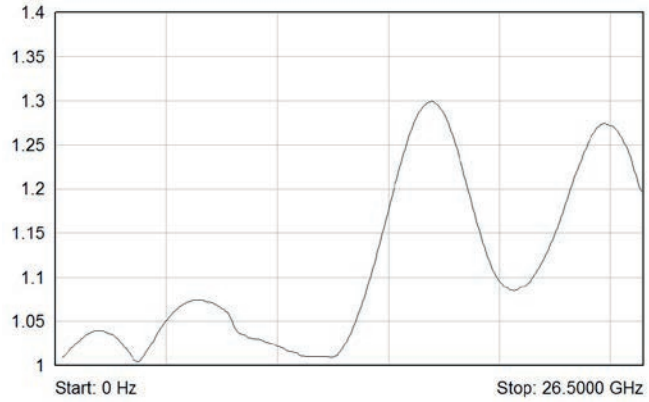
Typical Insertion Loss - 26.5 GHz Versions



Typical VSWR - 18 GHz Versions



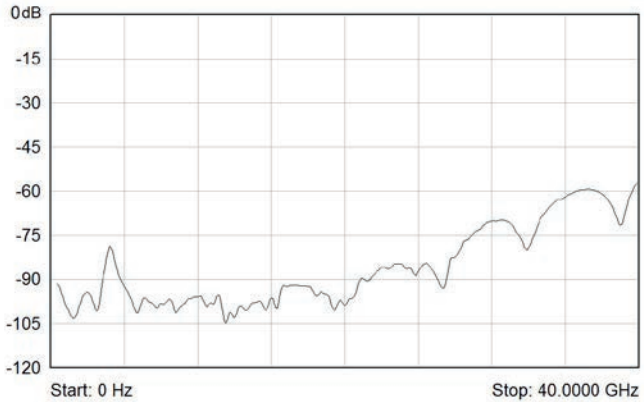
Typical Isolation - 26.5 GHz Versions



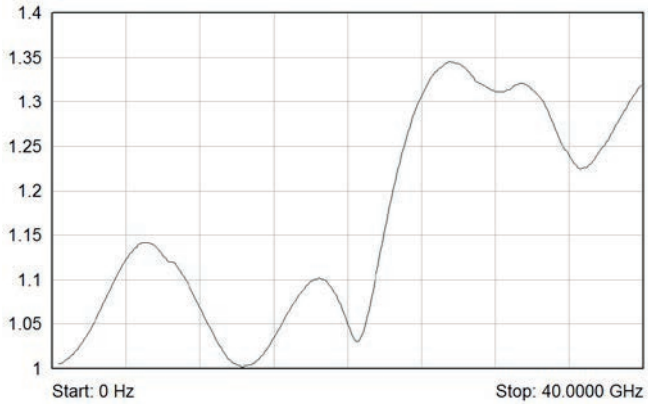
Typical VSWR - 26.5 GHz Versions

Specifications - 40 GHz & 50 GHz Versions

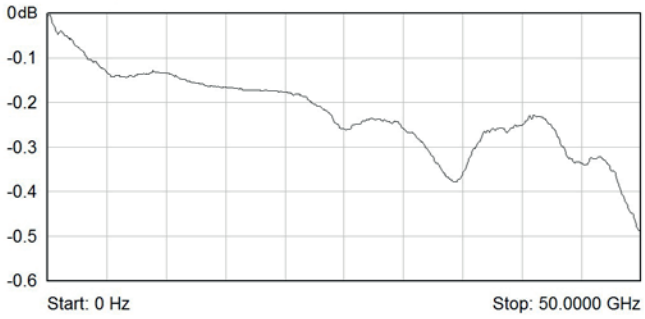
Connectors:	SMA-2.9 (40 GHz) SMA-2.4 (50 GHz)
Insertion Loss:	<0.8 dB to 40 GHz <1.1 dB to 50 GHz
Isolation:	>50 dB to 50 GHz
VSWR:	<1.9:1 to 50 GHz
RF Average Carry Power at 25 °C:	80 W to 6 GHz 60 W to 12.4 GHz 50 W to 18 GHz 20 W to 25.5 GHz 10 W to 40 GHz 5 W to 50 GHz



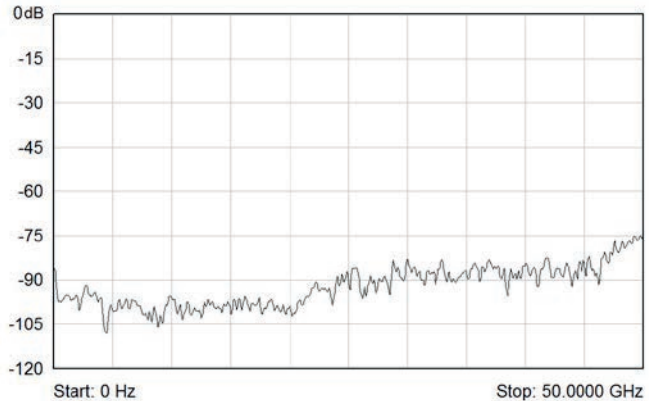
Typical Isolation - 40 GHz Versions



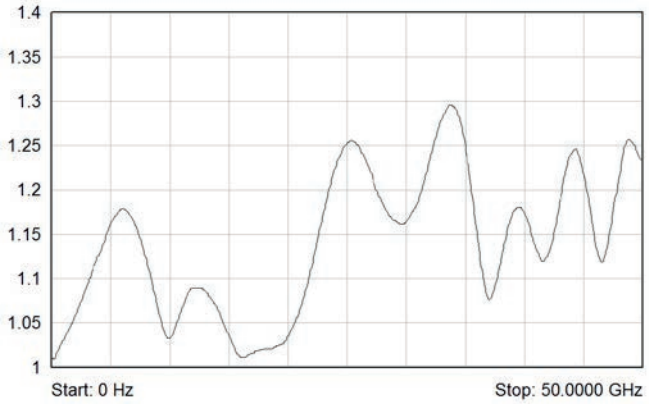
Typical VSWR - 40 GHz Versions



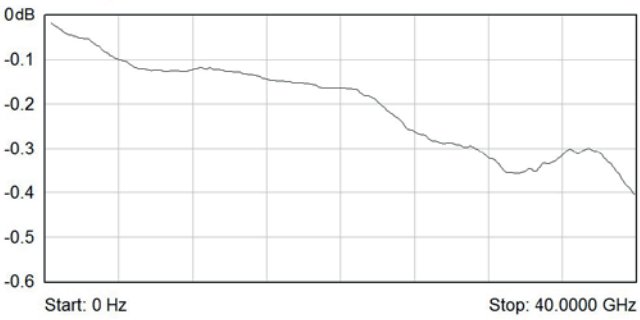
Typical Insertion Loss - 50 GHz Versions



Typical Isolation - 50 GHz Versions



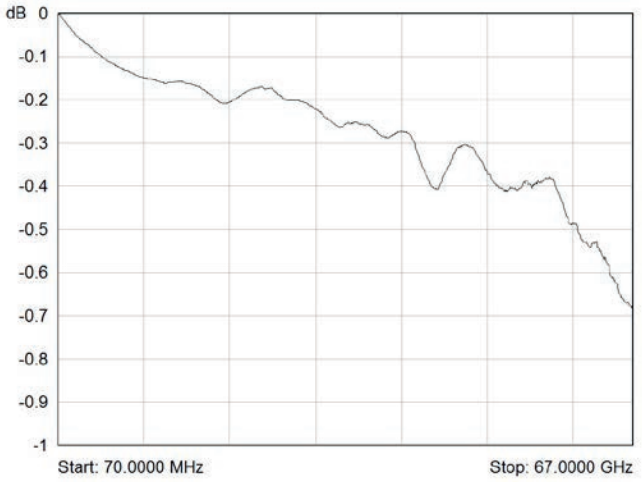
Typical VSWR - 50 GHz Versions



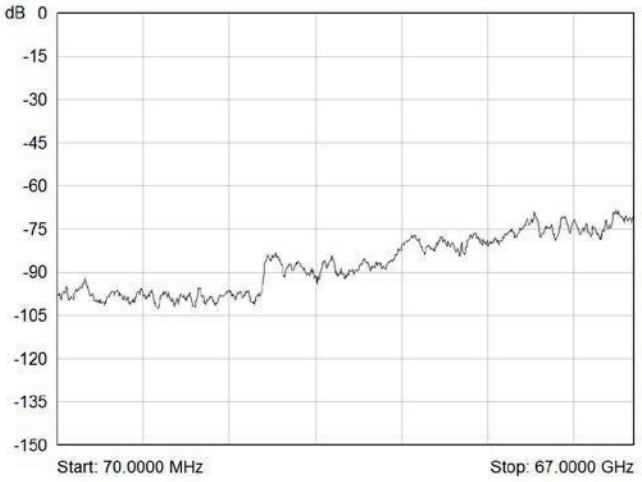
Typical Insertion Loss - 40 GHz Versions

Specifications - 67 GHz Versions

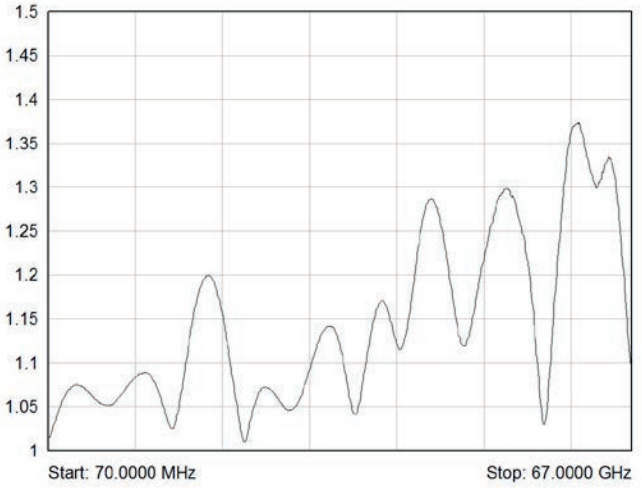
Connectors:	SMA-1.85
Insertion Loss:	<0.30 dB to 6 GHz <0.40 dB to 12.4 GHz <0.50 dB to 18 GHz <0.70 dB to 26.5 GHz <0.80 dB to 40 GHz <1.10 dB to 67 GHz
Isolation:	>70 dB to 6 GHz >60 dB to 12.4 GHz >60 dB to 18 GHz >55 dB to 26.5 GHz >50 dB to 67 GHz
VSWR:	<1.3:1 to 6 GHz <1.4:1 to 12.4 GHz <1.5:1 to 18 GHz <1.7:1 to 26.5 GHz <1.9:1 to 67 GHz
RF Average Carry Power at 25 °C:	80 W to 6 GHz 60 W to 12.4 GHz 50 W to 18 GHz 20 W to 26.5 GHz 10 W to 40 GHz 5 W to 50 GHz 3 W to 67 GHz



Typical Insertion Loss - 67 GHz Versions



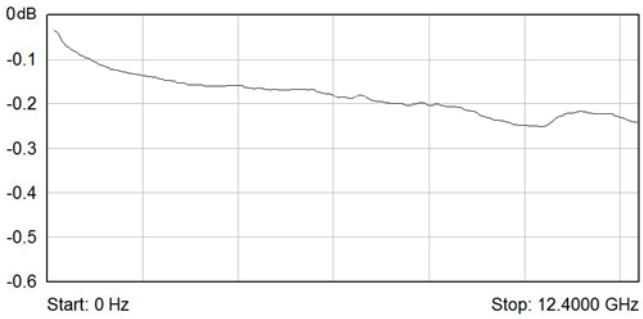
Typical Isolation - 67 GHz Versions



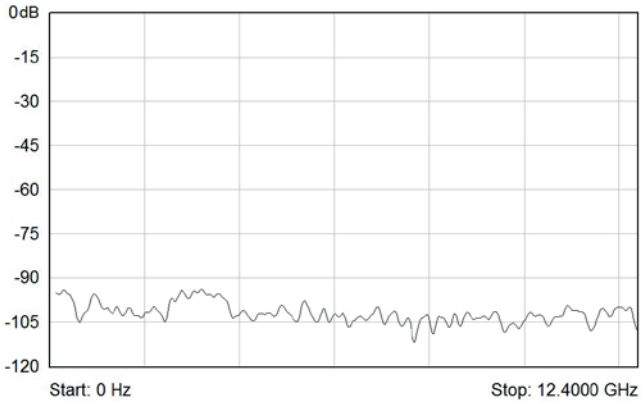
Typical VSWR - 67 GHz Versions

Specifications - 12.4 GHz N-type Versions

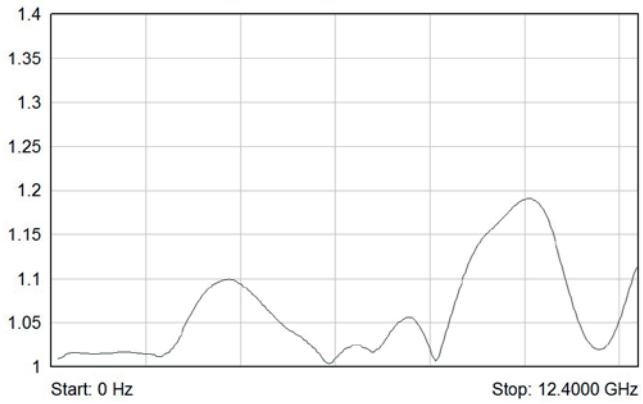
Connectors:	N-type
Insertion Loss:	<0.15 dB to 1 GHz <0.20 dB to 2 GHz <0.25 dB to 3 GHz <0.35 dB to 8 GHz <0.50 dB to 12.4 GHz
Isolation:	>85 dB to 1 GHz >80 dB to 2 GHz >75 dB to 3 GHz >70 dB to 8 GHz >60 dB to 12.4 GHz
VSWR:	<1.15:1 to 1 GHz <1.20:1 to 2 GHz <1.25:1 to 3 GHz <1.35:1 to 8 GHz <1.50:1 to 12.4 GHz
RF Average Carry Power at 25 °C:	700 W to 1 GHz 500 W to 2 GHz 400 W to 3 GHz 250 W to 8 GHz 200 W to 12.4 GHz



Typical Insertion Loss - 12.4 GHz N-Type Versions



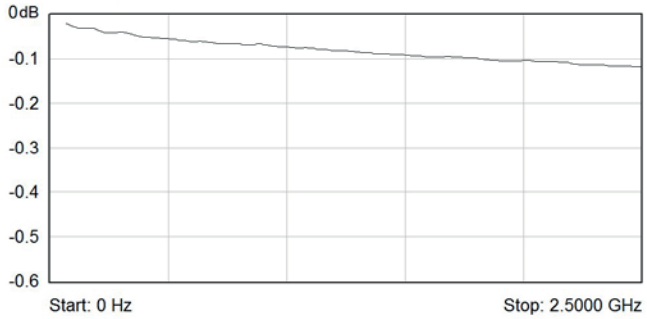
Typical Isolation - 12.4 GHz N-Type Versions



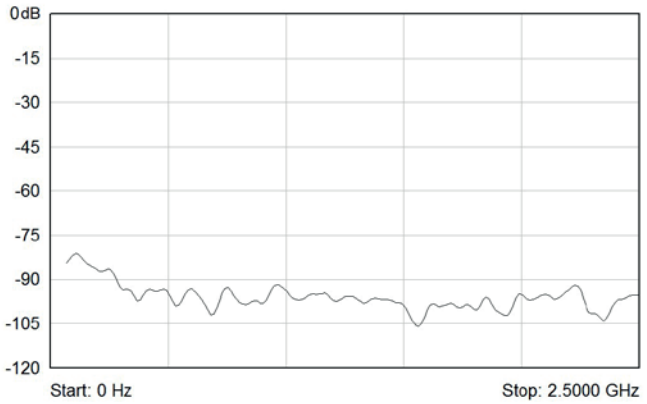
Typical VSWR - 12.4 GHz N-Type Versions

Specifications - 2.5 GHz 75Ω Versions

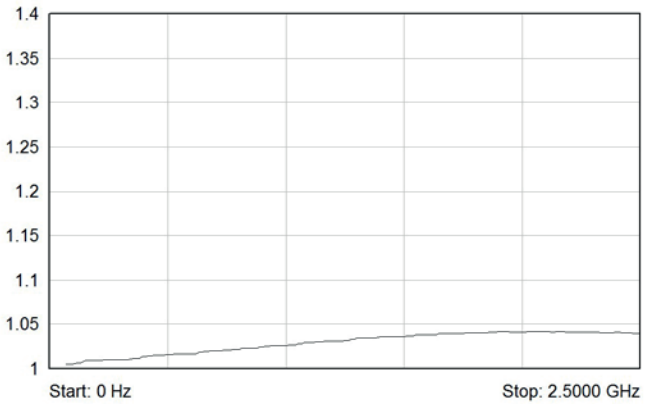
Connectors:	1.6/5.6 Female
Insertion Loss:	<0.20 dB to 1 GHz <0.30 dB to 2.5 GHz
Isolation:	>80 dB to 1 GHz >70 dB to 2.5 GHz
VSWR:	<1.20:1 to 1 GHz <1.30:1 to 2.5 GHz
RF Average Carry Power at 25 °C:	400 W to 1 GHz 240 W to 2.5 GHz



Typical Insertion Loss - 2.5 GHz 75 Ω Versions



Typical Isolation - 2.5 GHz 75 Ω Versions



Typical VSWR - 2.5 GHz 75 Ω Versions

General Specification

Configuration:	SPDT Microwave Switch, 1 to 4 independent banks.
Indicators:	Blue LEDs indicate activated relays
Operate Time:	15 ms for 12.4 GHz relays, 10 ms for all others
Expected Life:	>2 million operations for 67 GHz relays, >10 million operations for all other relays

Power Requirements - 40-780B

+3.3 V	+5 V	+12 V	-12 V
0.13 A	0.01 A	1.0 A	0

Power Requirements - 42-780B

+3.3 V	+12 V
0.36 A	1.0 A

Connectors

40-780B - PXI bus via 32-bit P1/J1 backplane connector.

42-780B - PXIe bus via XJ3 and XJ4 backplane connectors.

Signals via front panel mounted coaxial connectors:

- 2.5 GHz versions - 75 Ω 1.6/5.6 connectors
- 12.4 GHz versions - 50 Ω N-type connectors
- 18 GHz versions - 50 Ω SMA connectors
- 26.5 GHz versions - 50 Ω SMA connectors
- 40 GHz versions - 50 Ω SMA 2.9 connectors.
- 50 GHz versions - 50 Ω SMA 2.4 connectors.
- 67 GHz versions - 50 Ω SMA 1.85 connectors.

Mechanical Characteristics

Front panel mounted switches:

- 40-780B single & dual (except -511 & -512)
  - Single slot 3U PXI (CompactPCI card)
- 40-780B-511
  - Double slot 3U PXI (CompactPCI card)
- 40-780B-512
  - Triple slot 3U PXI (CompactPCI card)
- 40-780B triple & quad
  - Double slot 3U PXI (CompactPCI card)
- 42-780B single & dual (except -511 & -512)
  - Single slot 3U PXIe, compatible with PXIe hybrid slot
- 42-780B-511
  - Double slot 3U PXIe, compatible with PXIe hybrid slot
- 42-780B-512
  - Triple slot 3U PXIe, compatible with PXIe hybrid slot
- 42-780B triple & quad
  - Double slot 3U PXIe, compatible with PXIe hybrid slot

Remote mounted switches:

- 42-780B single, dual & triple remote mount versions
  - Single slot 3U PXIe, compatible with PXIe hybrid slot
- 40-780B single, dual & triple remote mount versions
  - Single slot 3U PXI (CompactPCI card)

Remote mounted switch versions are supplied with a 1.5 m interface cable for each of the supplied microwave relays.

Module weight: 200 g (40-780B-522).
3D models for all versions in a variety of popular file formats are available on request.

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

Product Order Codes

4[A]-780B-[B][C][D][E]

Interface
0 = PXI
2 = PXIe

Type
5 = SPDT 50 Ω
7 = SPDT 75 Ω (1.6/5.6 only)

Frequency
1 = 12.4 GHz (N-type only)
2 = 18 GHz (SMA)
3 = 26.5 GHz (SMA)
4 = 40 GHz (SMA 2.9)
5 = 50 GHz (SMA 2.4) or 2.5 GHz (1.6/5.6) when used with "7" for option "B"
7 = 67 GHz (SMA 1.85)

Options
[Blank] = Panel Mount
-E = Remote Mount

Quantity
1 or **2** for Panel Mount (N-type)
1, 2, 3 or **4** for Panel Mount (SMA, SMA 2.9, SMA 2.4, SMA 1.85, 1.6/5.6)
1, **2** or **3** for Remote Mount

Example part numbers:

A PXI dual, SPDT 26.5 GHz, panel mounted module would require part number **40-780B-532**
A PXIe single, SPDT 18 GHz, remote mounted module would require part number **42-780B-521-E**

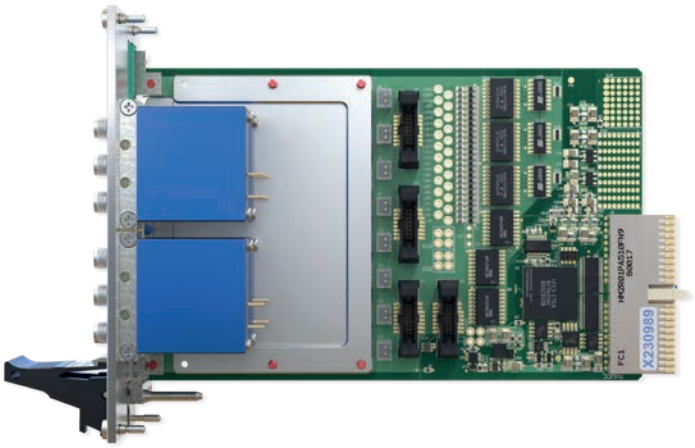
Please refer to the user manual for all individually defined valid part numbers.

Connection Accessories

For a complete list of connection accessories and documentation for the 4x-780B module please refer to our RF connectors datasheet (90-011D).

Warranty

This module carries a 3 year warranty. The warranty specifically applies to only the cold switching operations of the relay within the stated lifetime.



Side View of the PXI Quad SPDT Microwave Relay Module

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.

42-780B-524 PXIe Quad SPDT Microwave Relay Module

PXI & CompactPCI Compliance - 40-780B

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.

PXIe Compliance - 42-780B

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.

The 4x-780B is part of a range of switching modules suitable for RF and microwave applications.

Pickering's Range of PXI & PXIe Microwave Switching Modules			
Switch Type	Banks	Frequency Range	Model No.
SPDT Unterminated	1, 2, 3 or 4 Panel Mount, 1, 2 or 3 Remote Mount	2.5 GHz (75Ω) or 12.4 - 67 GHz (50Ω)	4x-780B
SPDT Terminated	1 or 2 Panel Mount	18 - 50 GHz (50Ω)	4x-781A
Transfer Switch	1 or 2 Panel Mount	18 - 50 GHz (50Ω)	4x-782B
SP4T or SP6T Unterminated	1, 2 or 3 Panel Mount, 1, 2 or 3 Remote Mount	6 - 40 GHz (50Ω)	4x-784B
SP4T or SP6T Terminated or Unterminated	1 or 2 Panel Mount, 1, 2 or 3 Remote Mount	2.5 GHz (75Ω) or 3 - 67 GHz (50Ω)	4x-785C
SP8T, SP10T or SP12T Terminated or Unterminated	1 or 2 Panel Mount, 1 or 2 Remote Mount	8 - 26.5 GHz (50Ω)	4x-788

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:

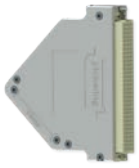
- Mix our 1000+ PXI/PXIe switching & simulation modules with any vendor's PXI/PXIe instrumentation
- Embedded or remote Windows PC control
- Real-time Operating System Support
- High data bandwidths, especially with PXI Express
- Integrated module timing and synchronization

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

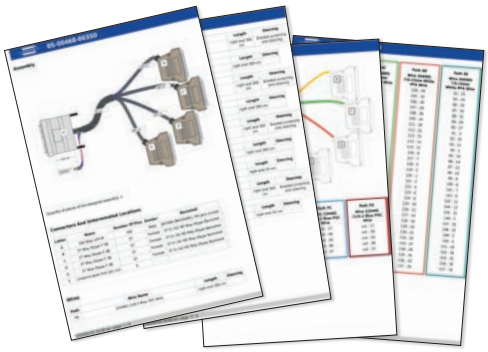
Breakouts

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



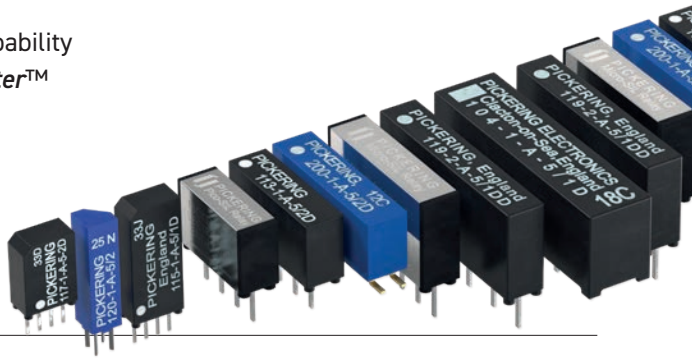
Mass Interconnect

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

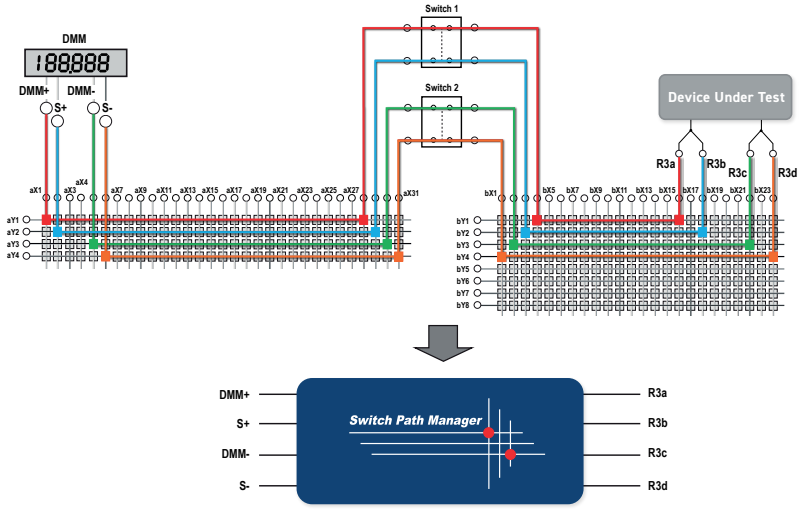
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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