

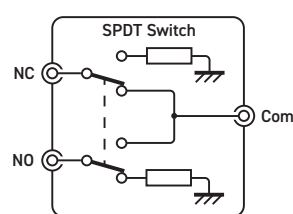
PXI/PXIe Terminated SPDT Microwave Relays 4x-781A

- Available as PXI or PXIe Modules
- 1 or 2 Changeover Relays Per Module
- Remote Mounted Version Available
- Internal or External Termination
- 50 Ω Characteristic Impedance
- 18 GHz, 26.5 GHz, 40 GHz & 50 GHz Bandwidths
- Relay Cycle Counting Included
- LED Indication
- Drivers Supplied for Windows & Linux, Plus Support for Real-time Systems
- PXI Version Supported by PXI or LXI Chassis
- 3 Year Warranty

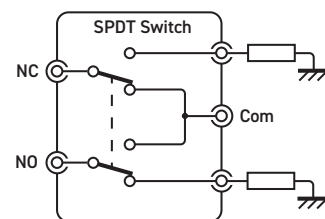


The 40-781A (PXI) and 42-781A (PXIe) modules consist of one, or two microwave changeover switches capable of switching up to 50 GHz in 50 Ω . They are available with either internal or external terminations and connections are via front panel mounted high quality SMA, SMA 2.9 or SMA 2.4 connectors.

Externally terminated versions have the advantage that the terminations can be removed and replaced with higher power RF loads. This also allows alternative configurations such as terminated 4-port bypass (1 termination removed) and 5-port DP3T (both terminations removed). See overleaf for diagrams of these configurations.



Internally Terminated



Externally Terminated

Microwave Switch (Part No. 4x-781A-xx1)
in Single SPDT Format

The 4x-781A gives you the highest RF 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 at lower frequencies where power handling to 240 W (without termination) is required.

Remote Versions

The remote versions, as well as occupying less panel space in the case of the dual 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 switches are supplied with a 1.5 m interface cable.



PXI Dual SPDT Microwave Switch with Internal Termination



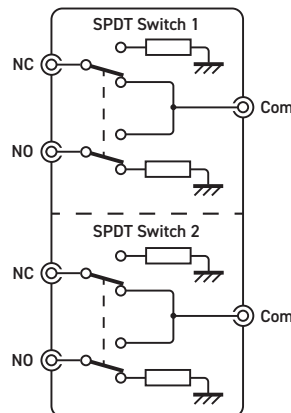
Remote version controls 1 or 2 remotely mounted SPDT microwave relays via interface cables

Product Compatibility

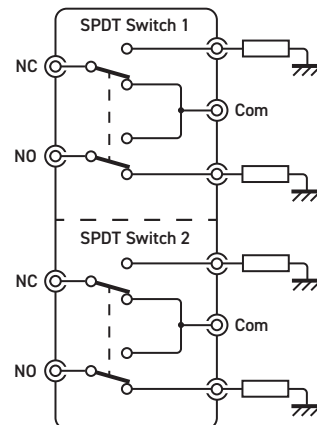
The 4x-781A range has been introduced as an update to the existing 40-781 family. These remain orderable but the new 4x-781A is recommended as it provides additional options such as the PXIe control interface. The RF performance of the 4x-781A is identical to the 40-781.

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).



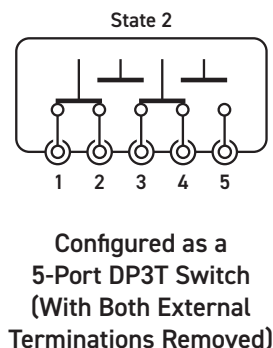
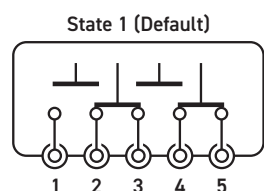
Internally Terminated



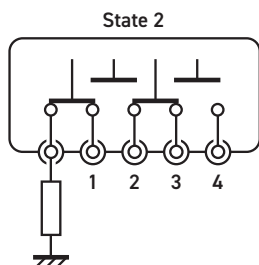
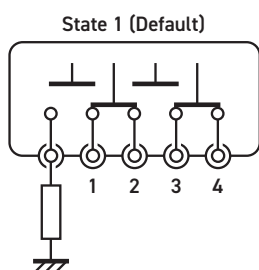
Externally Terminated

Microwave Switch (Part No. 4x-781A-xx2)
in Dual SPDT Format

Alternative Configurations for Externally Terminated Versions

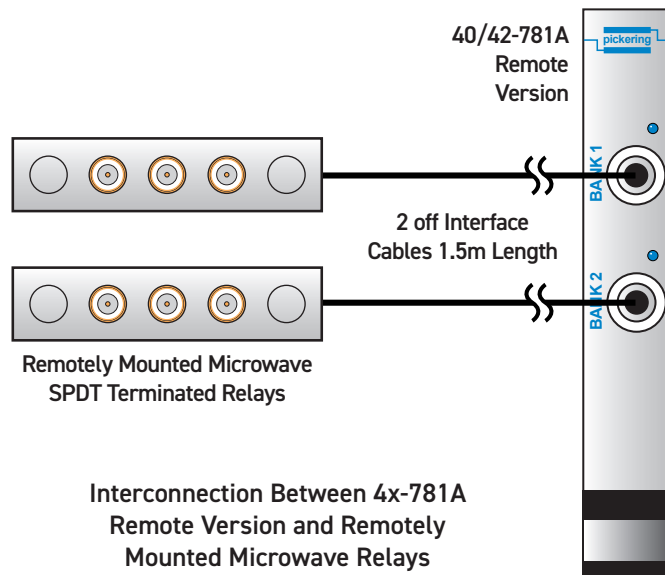


Configured as a
5-Port DP3T Switch
(With Both External
Terminations Removed)



Configured as a Terminated
4-Port Bypass Switch
(With One External
Termination Removed)

Remotely Mounted Microwave Relay Versions



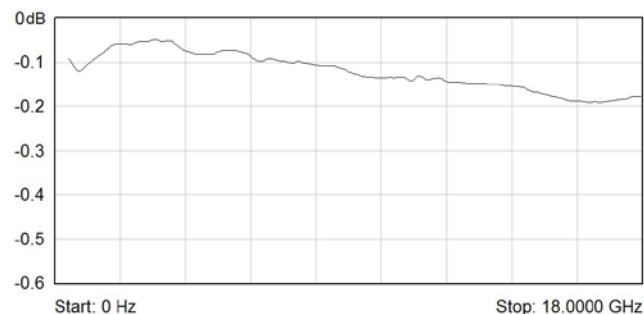
Interconnection Between 4x-781A
Remote Version and Remotely
Mounted Microwave Relays



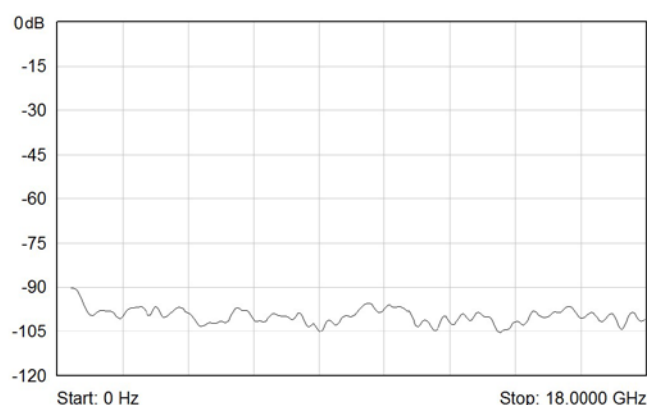
Microwave SPDT
Terminated Relay &
Cable for Remote
Mounting

Specifications - 18GHz Versions

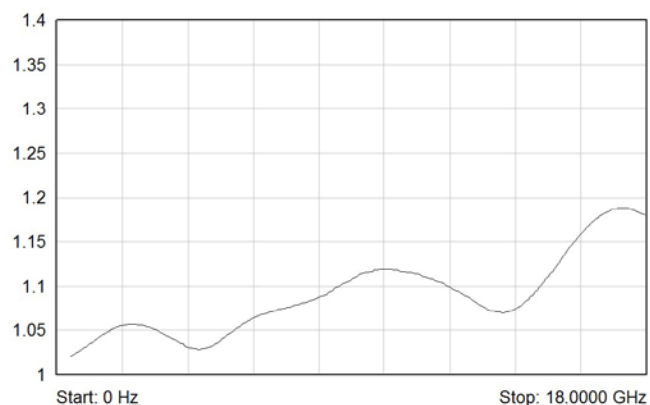
Characteristic Impedance:	50 Ω
Connector Type:	SMA
Insertion Loss:	<0.2 dB to 3 GHz <0.3 dB to 8 GHz <0.4 dB to 12.4 GHz <0.5 dB to 18 GHz
Isolation:	>80 dB to 3 GHz >70 dB to 8 GHz >60 dB to 18 GHz
VSWR:	$<1.2:1$ 0 to 3 GHz $<1.3:1$ to 8 GHz $<1.4:1$ to 12.4 GHz $<1.5:1$ to 18 GHz
Power Handling - Externally Terminated Versions:	1 W limited by terminations.
Note: External terminations can be removed and replaced with higher power loads.	
Power Handling - Internally Terminated Versions:	1 W limited by terminations.
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
Operate Time:	10 ms
Expected Life	
40/42-781A-1xx:	>10 million operations
40/42-781A-0xx:	>2 million operations



Typical Insertion Loss - 18 GHz Versions



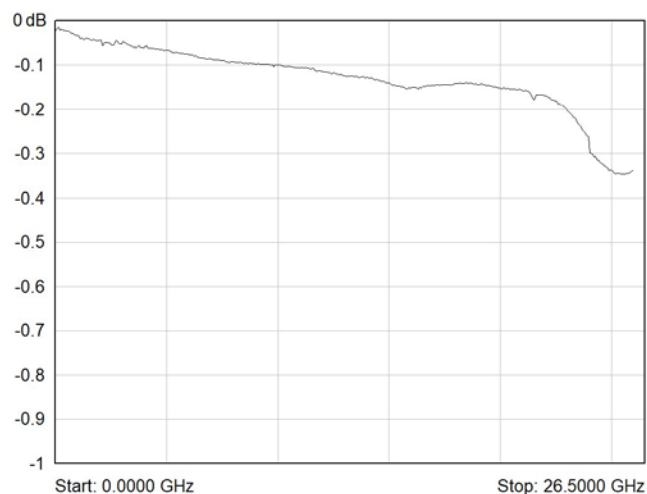
Typical Isolation - 18 GHz Versions



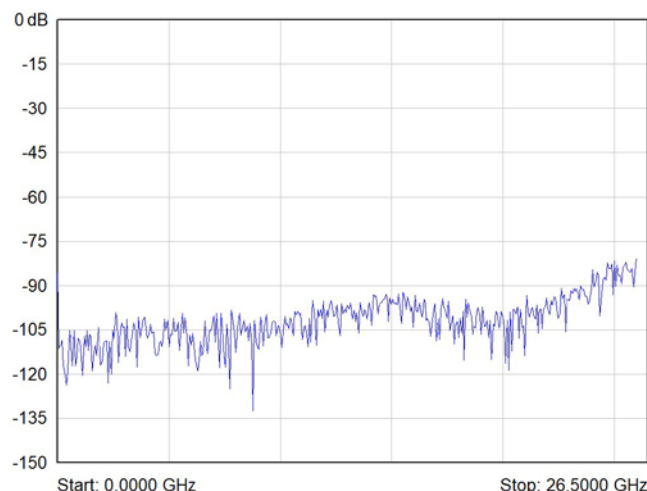
Typical VSWR - 18 GHz Versions

Specifications - 26.5GHz Versions

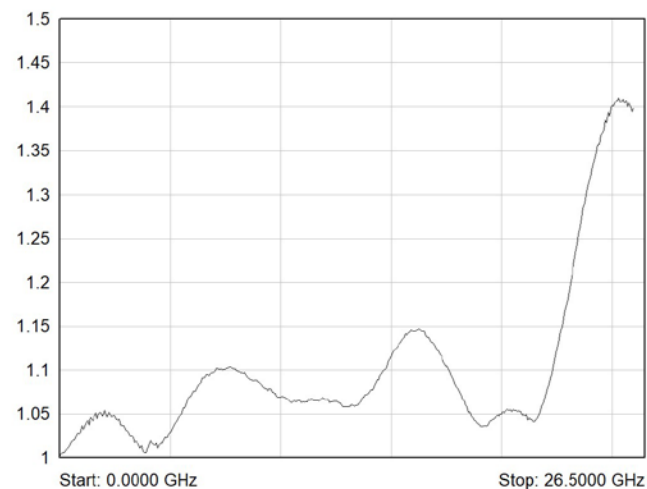
Characteristic Impedance:	50 Ω
Connector Type:	SMA
Insertion Loss:	<0.2 dB to 3 GHz <0.3 dB to 8 GHz <0.4 dB to 12.4 GHz <0.5 dB to 18 GHz <0.7 dB to 26.5 GHz
Isolation:	>80 dB to 3 GHz >70 dB to 8 GHz >60 dB to 12.4 GHz >60 dB to 18 GHz >55 dB to 26.5 GHz
VSWR:	$<1.2:1$ 0 to 3 GHz $<1.3:1$ to 8 GHz $<1.4:1$ to 12.4 GHz $<1.5:1$ to 18 GHz $<1.7:1$ to 26.5 GHz
Power Handling - Externally Terminated Versions:	1 W limited by terminations.
Note: External terminations can be removed and replaced with higher power loads.	
Power Handling - Internally Terminated Versions:	1 W limited by terminations.
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
Operate Time:	10 ms
Expected Life	
40/42-781A-3xx:	>10 million operations
40/42-781A-2xx:	>2 million operations



Typical Insertion Loss - 26.5 GHz Versions



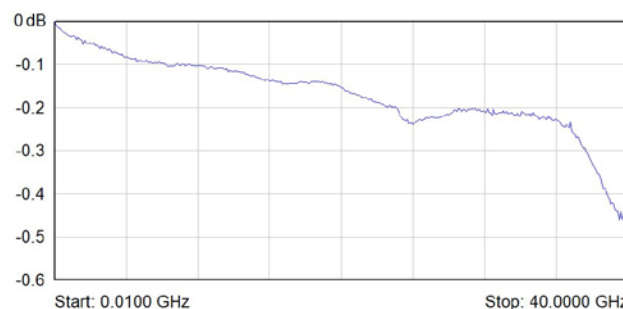
Typical Isolation - 26.5 GHz Versions



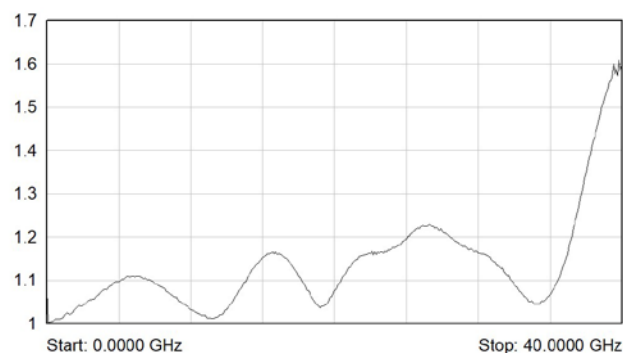
Typical VSWR - 26.5 GHz Versions

Specifications - 40GHz Versions

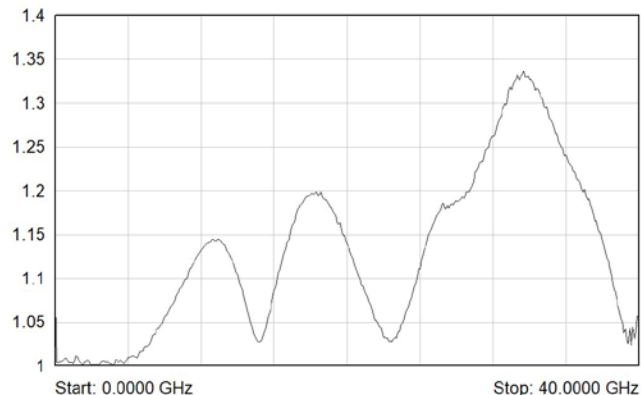
Characteristic Impedance:	50 Ω
Connector Type:	SMA 2.9
Insertion Loss:	<0.3 dB to 6 GHz <0.4 dB to 12.4 GHz <0.5 dB to 18 GHz <0.7 dB to 26.5 GHz <0.8 dB to 40 GHz
Isolation:	>70 dB to 6 GHz >60 dB to 12.4 GHz >60 dB to 18 GHz >55 dB to 26.5 GHz >50 dB to 40 GHz
VSWR:	$<1.3:1$ to 6 GHz $<1.4:1$ to 12.4 GHz $<1.5:1$ to 18 GHz $<1.7:1$ to 26.5 GHz $<1.9:1$ to 40 GHz
Power Handling - Externally Terminated Versions:	1 W limited by terminations.
Note: External terminations can be removed and replaced with higher power loads.	
Power Handling - Internally Terminated Versions:	1 W limited by terminations.
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
Operate Time:	10 ms
Expected Life	
40/42-781A-5xx:	>10 million operations
40/42-781A-4xx:	>2 million operations



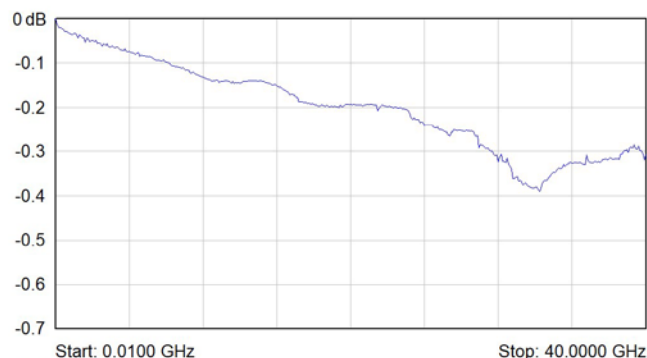
Typical Insertion Loss - 40 GHz Internally Terminated Versions



Typical VSWR - 40 GHz Internally Terminated Versions



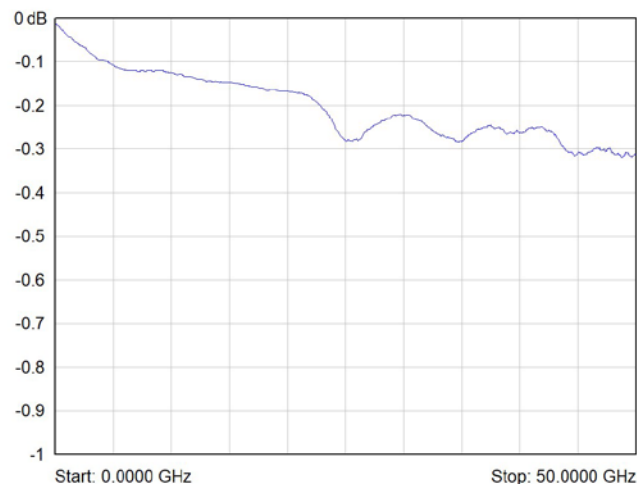
Typical VSWR - 40 GHz Externally Terminated Versions



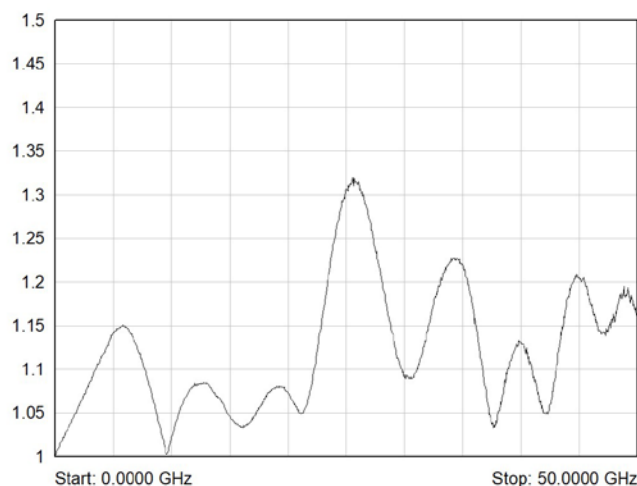
Typical Insertion Loss - 40 GHz Externally Terminated Versions

Specifications - 50GHz Versions

Characteristic Impedance:	50 Ω
Connector Type:	SMA 2.4
Insertion Loss:	<0.3 dB to 6 GHz <0.4 dB to 12.4 GHz <0.5 dB to 18 GHz <0.7 dB to 26.5 GHz <0.8 dB to 40 GHz <1.1 dB to 50 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 40 GHz >50 dB to 50 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 40 GHz $<1.9:1$ to 50 GHz
Power Handling - External Terminations:	0.5 W limited by terminations.
Note: External terminations can be removed and replaced with higher power loads.	
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
Operate Time:	10 ms
Expected Life	>2 million operations



Typical Insertion Loss - 50 GHz Versions



Typical Switch VSWR - 50 GHz Versions

General Specification

Configuration:	SPDT Microwave Switch with automatic termination on the NO and NC paths, 1 or 2 independent banks mounted on the module's front panel or remotely mounted and controlled via interface cables.
LED Indicators:	Blue LEDs to indicate activated relays.

Power Requirements - 40-781A

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

Power Requirements - 42-781A

+3.3 V	+12 V
0.36 A	1.0 A

Mechanical Characteristics

Front Panel Mounted Switches

- 40-781A single SPDT
 - Single slot 3U PXI (CompactPCI card)
- 40-781A dual SPDT
 - Double slot 3U PXI (CompactPCI card)
- 42-781A single SPDT
 - Single slot 3U PXIe, compatible with PXIe hybrid slot
- 42-781A dual SPDT
 - Double slot 3U PXIe, compatible with PXIe hybrid slot

Remote mounted switches:

- 42-781A single & dual remote mount versions
 - Single slot 3U PXIe, compatible with PXIe hybrid slot
- 40-781A single, & dual 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.

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

Connectors

40-781A - PXI bus via 32-bit P1/J1 backplane connector.

42-781A - PXIe bus via XJ3 and XJ4 backplane connectors.

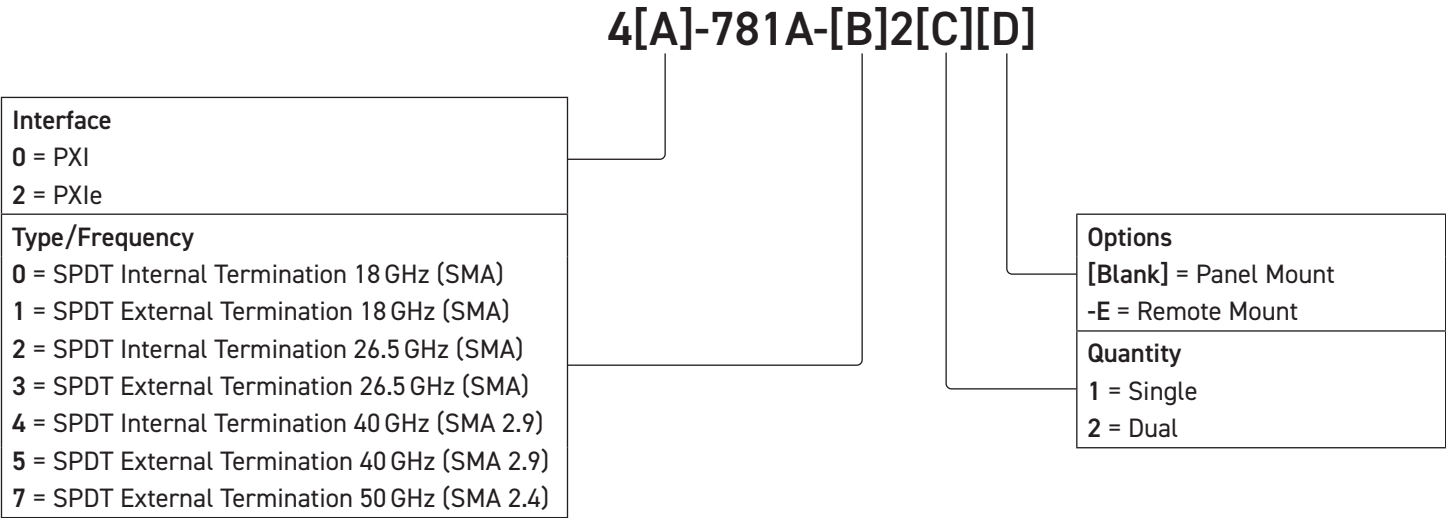
Signals via front panel mounted coaxial connectors:

- 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

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



Example part numbers:

A PXI single SPDT 18 GHz microwave switch with internal termination and a front panel mounted relay would require part number **40-781A-021**

A PXIe dual SPDT 26.5 GHz microwave switch with external termination and remotely mounted relays would require part number **42-781A-322-E**

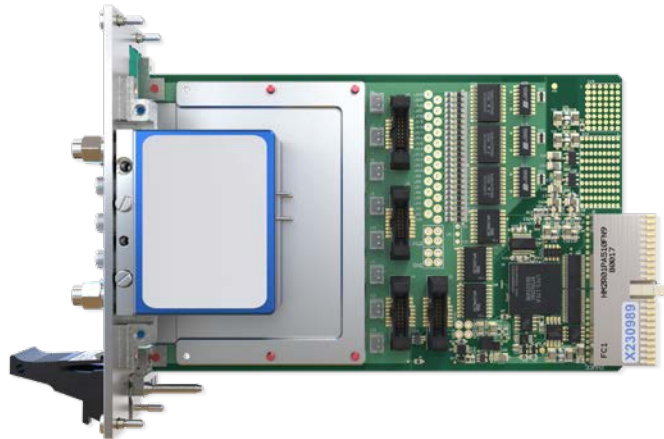
Please refer to the user manual for all individually defined valid part numbers.

Connection Accessories

For a complete list of connection accessories and documentation for the 4x-781A 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 Dual Externally Terminated Microwave Switch

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.

PXI & CompactPCI Compliance - 40-781A

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 - 42-781A

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.



42-781A-022 PXIe Dual SPDT Microwave Switch with Internal Termination



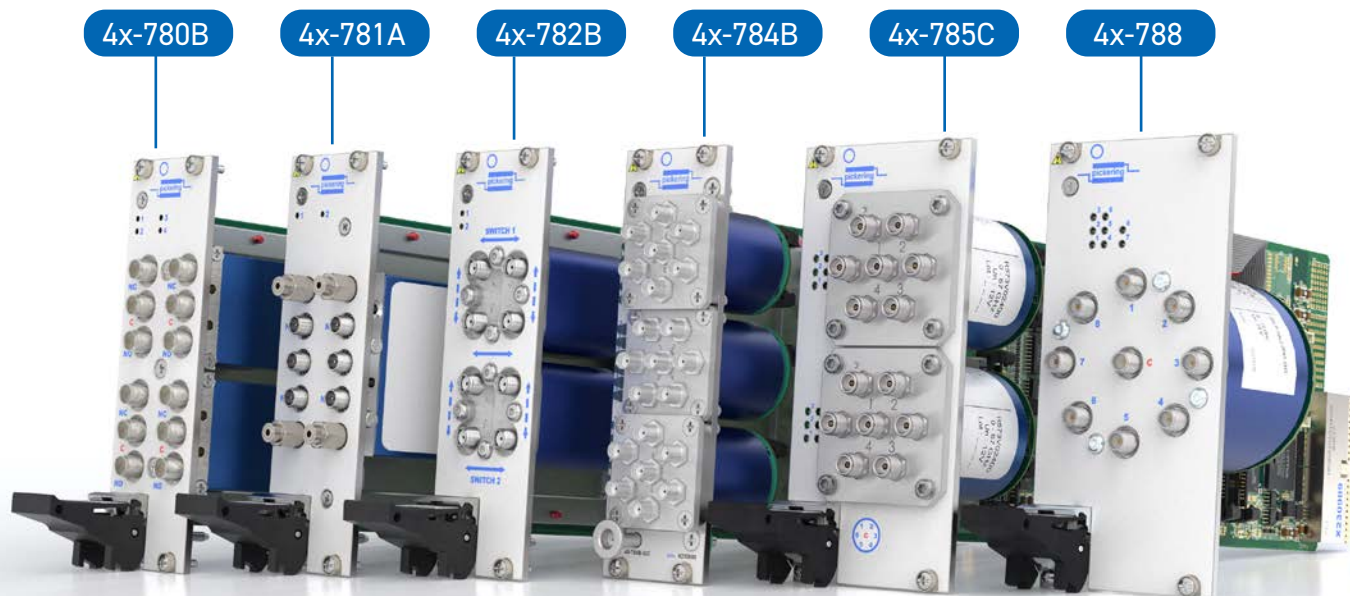
42-781A-121 PXIe Single SPDT Microwave Switch with External Termination

PXI/PXIe Terminated SPDT Microwave Relays 4x-781A

The 4x-781A 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 (75 Ω) or 12.4 - 67 GHz (50 Ω)	4x-780B
SPDT Terminated	1 or 2 Panel Mount, 1 or 2 Remote Mount	18 - 50 GHz (50 Ω)	4x-781A
Transfer Switch	1 or 2 Panel Mount, 1 or 2 Remote Mount	18 - 50 GHz (50 Ω)	4x-782B
SP4T or SP6T Unterminated	1, 2 or 3 Panel Mount, 1, 2 or 3 Remote Mount	6 - 40 GHz (50 Ω)	4x-784B
SP4T or SP6T Terminated or Unterminated	1 or 2 Panel Mount, 1, 2 or 3 Remote Mount	2.5 GHz (75 Ω) or 3 - 67 GHz (50 Ω)	4x-785C
SP8T, SP10T or SP12T Terminated or Unterminated	1 or 2 Panel Mount, 1 or 2 Remote Mount	8 - 26.5 GHz (50 Ω)	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



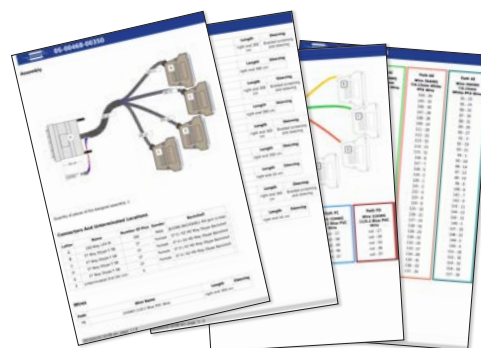
Breakouts



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

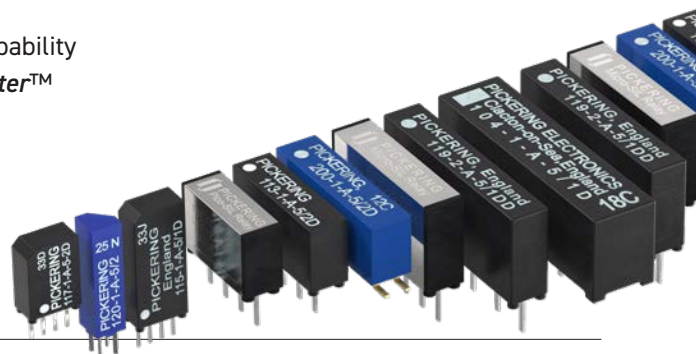
Mass Interconnect

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

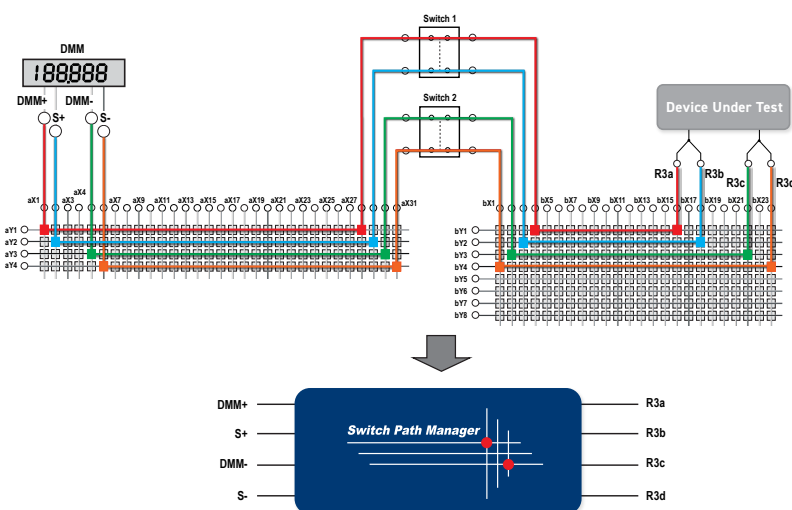
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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

