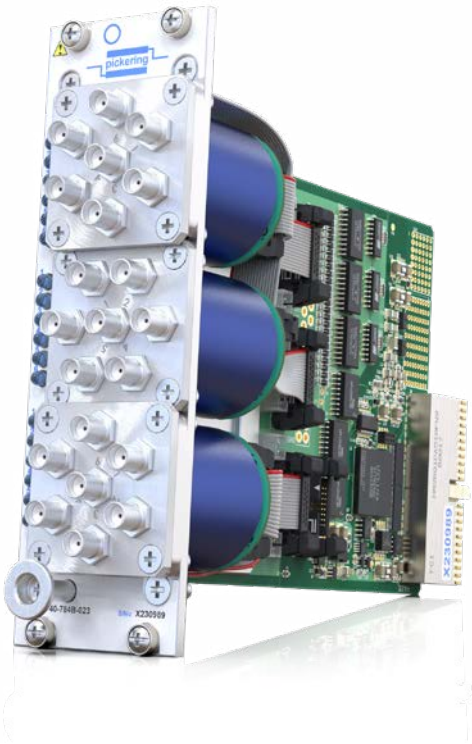
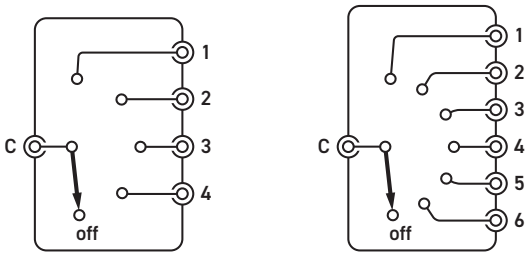
PXI/PXIe Microwave Multiplexer Modules 4x-784B

- Available as PXI or PXIe Modules
- Single or Dual SP4T or SP6T Panel Mounted Multiplexer
- Up To 3 Remote SP4T or SP6T Multiplexers From Single Slot Version
- 50 Ω Versions With 3-67 GHz Bandwidth
- 50 Ω Terminated and Unterminated Versions
- 75 Ω Version With 2.5 GHz Bandwidth
- Failsafe & Latching Relay Options
- Relay Cycle Counting Included
- LED Indication (Failsafe Versions Only)
- VISA, IVI & Kernel Drivers Supplied for Windows
- PXI Version Supported by PXI or LXI Chassis
- 3 Year Warranty



The 40-784B (PXI) and 42-784B (PXIe) microwave multiplexer modules have a characteristic impedance of 50 Ω and are capable of switching signals up to 40 GHz. Available in single, dual or triple, SP6T or SP4T formats, they are suitable for constructing complex microwave switching. Connection is by high performance SMA or SMA 2.9 connectors. Remote versions are also available which can support up to three multiplexers in a single slot.

The remote versions, as well as occupying less PXI panel space, 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 1.5m interface cable.



Microwave Multiplexer (Part No. 4x-784B) in Single SP4T & SP6T Formats

Single slot version controls 1, 2 or 3 remotely mounted microwave multiplexers via interface cables

The 4x-784B provides a high performance solution for RF and microwave switching, the performance at low frequencies providing superior isolation, insertion loss and VSWR to EMR or solid state designs.

Product Compatibility

The 4x-784B range has been introduced as an update to the existing 40-784A family. The existing family remains orderable but the new 4x-784B is recommended as it provides additional options such as the PXIe control interface. The RF performance of the 4x-784B is identical to the existing 40-784A.

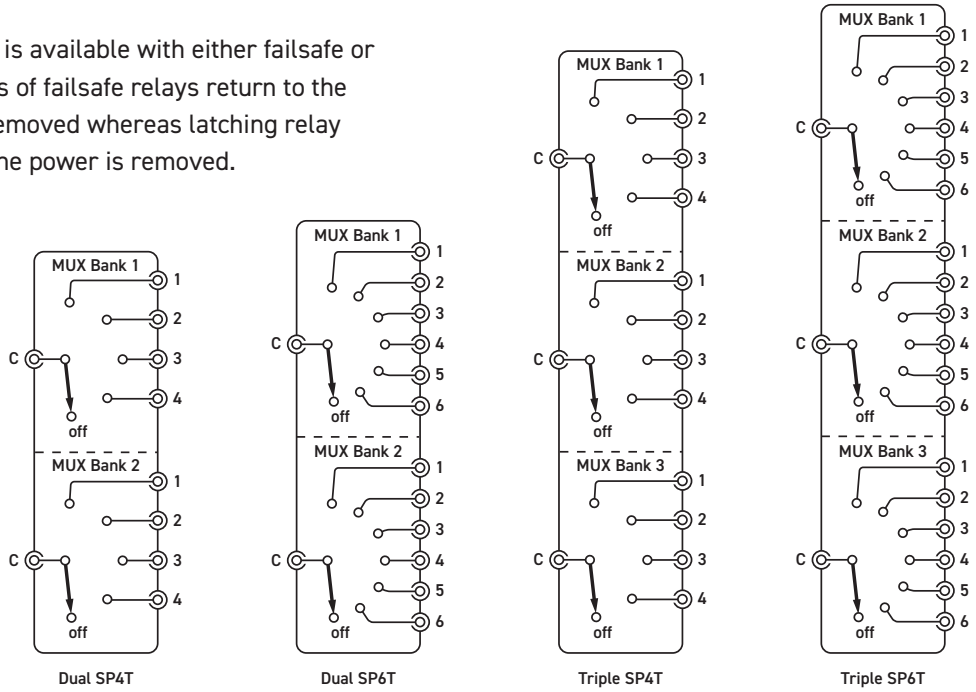
Issue 3.2 August 2022

Relay Type

To provide maximum flexibility this range is available with either failsafe or latching relays. For definition, the contacts of failsafe relays return to the default state when the system power is removed whereas latching relay contacts retain their last set state when the power is removed.

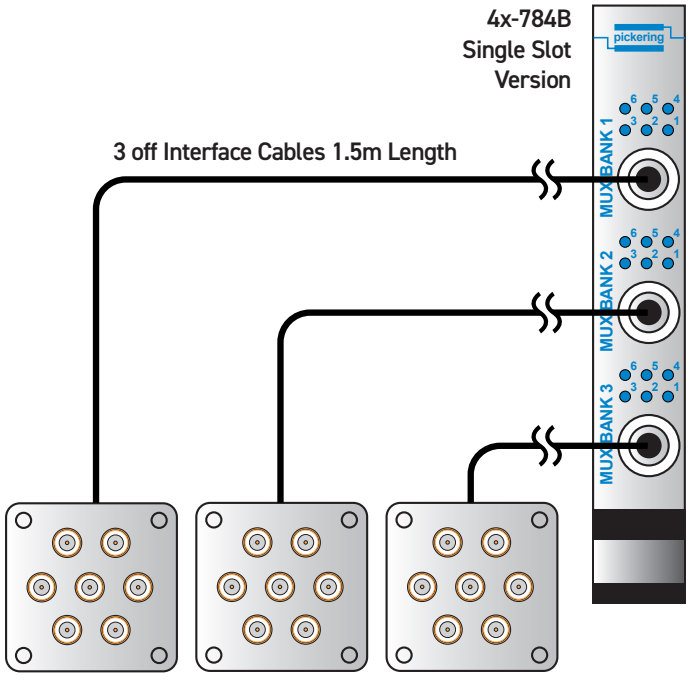
Relay Cycle Counting

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).



4x-784B Multiplexer in Dual & Triple SP4T & SP6T Formats

Remotely Mounted Microwave Multiplexer Versions



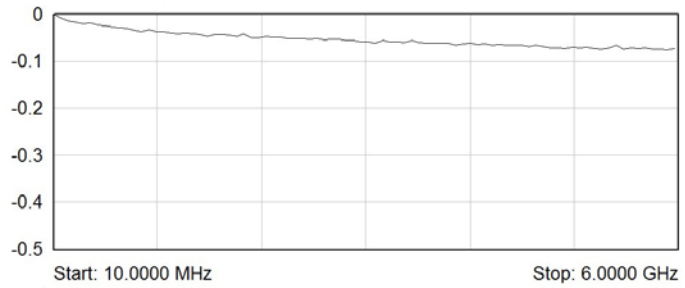
Remotely Mounted Microwave Multiplexers

Interconnection Between 4x-784B Single Slot Version and Remotely Mounted Microwave Multiplexers

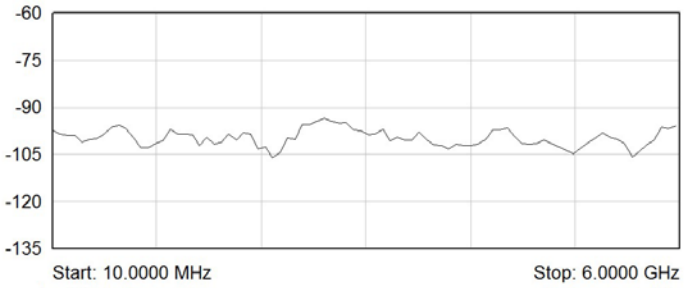
Remote Mount Microwave Multiplexers
- With and Without Optional Mounting Bracket

RF Specification - 6 GHz Versions

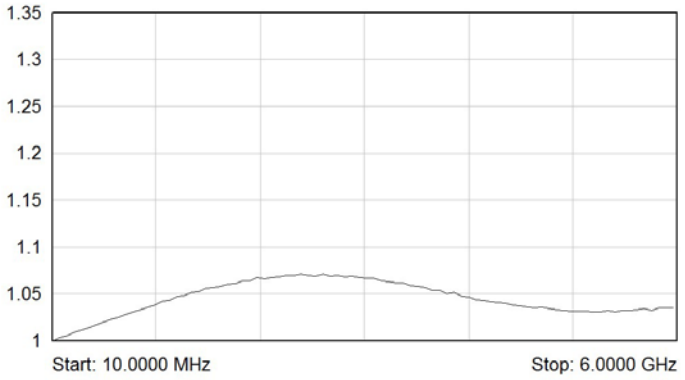
Characteristic Impedance:	50 Ω
Connectors:	SMA
Bandwidth	DC to 6 GHz
Maximum RF Carry Power:	220 W (0-3 GHz) 150 W (3-6 GHz)
Isolation:	>80 dB (0-3 GHz) >70 dB (3-6 GHz)
Insertion Loss:	<0.2 dB (0-3 GHz) <0.3 dB (3-6 GHz)
VSWR:	<1:1.2 (0-3 GHz) <1:1.3 (3-6 GHz)
Expected Life (low power):	>10 million operations per position guaranteed (typically >25 million)
Insertion Loss Repeatability:	Within 0.01 dB



Typical Insertion Loss (dB) - 6 GHz Versions



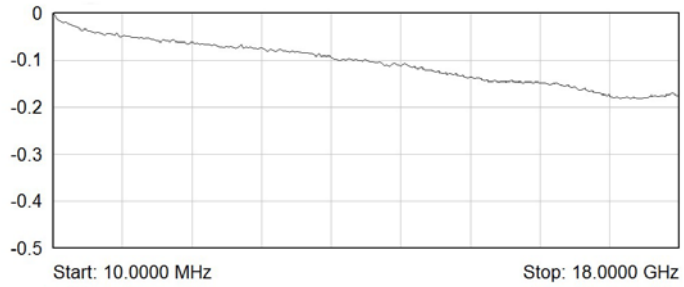
Typical Isolation (dB) - 6 GHz Versions



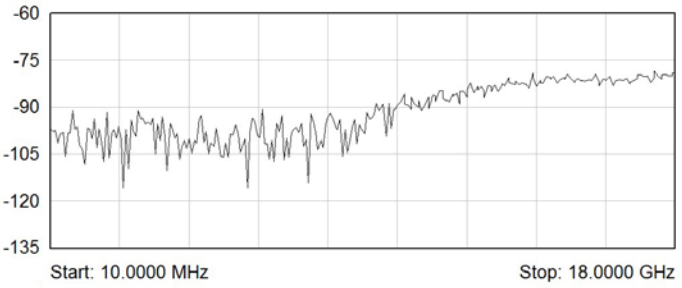
Typical VSWR - 6 GHz Versions

RF Specification - 18 GHz Versions

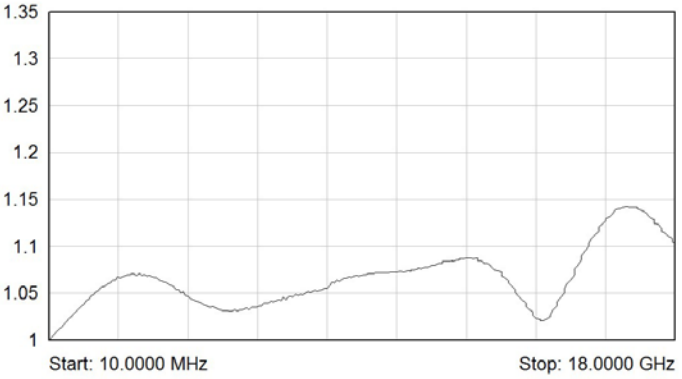
Characteristic Impedance:	50 Ω
Connectors:	SMA
Bandwidth	DC to 18 GHz
Maximum RF Carry Power:	220 W (0-3 GHz) 150 W (3-8 GHz) 120 W (8-12.4 GHz) 100 W (12.4-18 GHz)
Isolation:	>80 dB (0-3 GHz) >70 dB (3-8 GHz) >60 dB (8-12.4 GHz) >60 dB (12.4-18 GHz)
Insertion Loss:	<0.2 dB (0-3 GHz) <0.3 dB (3-8 GHz) <0.4 dB (8-12.4 GHz) <0.5 dB (12.4-18 GHz)
VSWR:	<1:1.2 (0-3 GHz) <1:1.3 (3-8 GHz) <1:1.4 (8-12.4 GHz) <1:1.5 (12.4-18 GHz)
Expected Life (low power):	>10 million operations per position guaranteed (typically >25 million)
Insertion Loss Repeatability:	Within 0.025 dB
Propagation Delay Variation (between channels):	<1 ps



Typical Insertion Loss (dB) - 18 GHz Versions



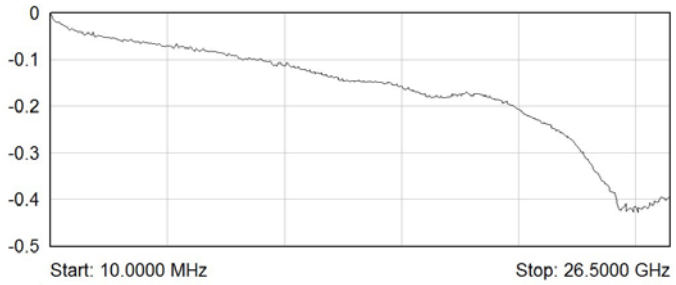
Typical Isolation (dB) - 18 GHz Versions



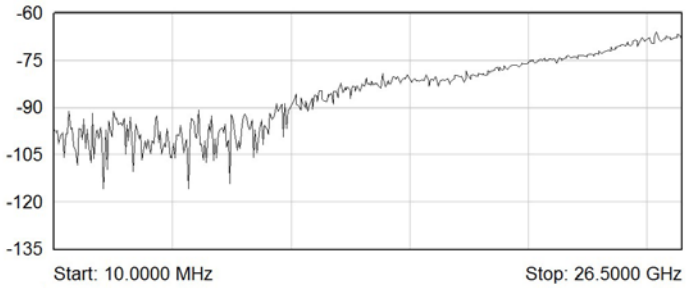
Typical VSWR - 18 GHz Versions

RF Specification - 26.5 GHz Versions

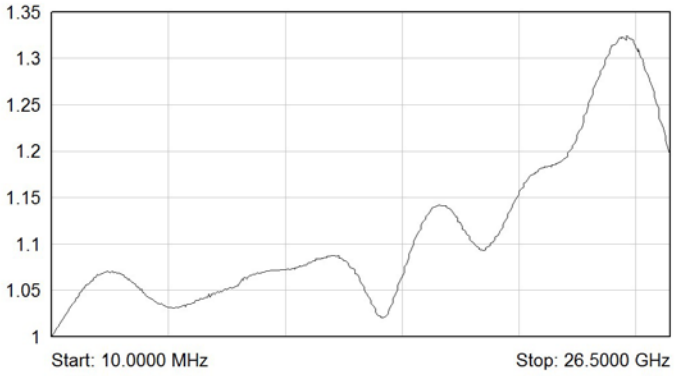
Characteristic Impedance:	50 Ω
Connectors:	SMA
Bandwidth	DC to 26.5 GHz
Maximum RF Carry Power:	220 W (0-3 GHz) 150 W (3-8 GHz) 120 W (8-12.4 GHz) 100 W (12.4-18 GHz) 40 W (18-26.5 GHz)
Isolation:	>80 dB (0-3 GHz) >70 dB (3-8 GHz) >60 dB (8-12.4 GHz) >60 dB (12.4-18 GHz) >55 dB (18-26.5 GHz)
Insertion Loss:	<0.2 dB (0-3 GHz) <0.3 dB (3-8 GHz) <0.4 dB (8-12.4 GHz) <0.5 dB (12.4-18 GHz) <0.6 dB (18-26.5 GHz)
VSWR:	<1:1.2 (0-3 GHz) <1:1.3 (3-8 GHz) <1:1.4 (8-12.4 GHz) <1:1.5 (12.4-18 GHz) <1:1.6 (18-26.5 GHz)
Expected Life (low power):	>10 million operations per position guaranteed (typically >25 million)
Insertion Loss Repeatability:	Within 0.035 dB



Typical Insertion Loss (dB) - 26.5 GHz Versions



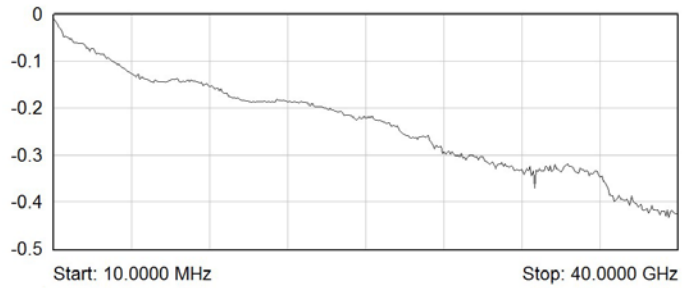
Typical Isolation (dB) - 26.5 GHz Versions



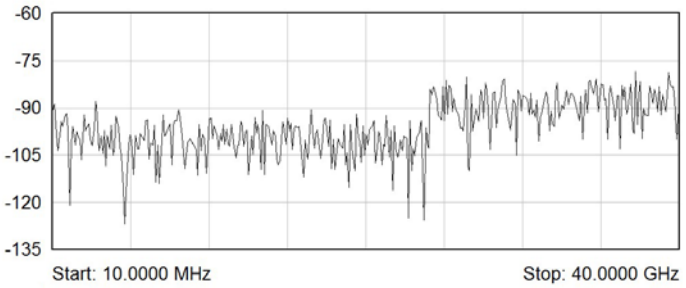
Typical VSWR - 26.5 GHz Versions

RF Specification - 40 GHz Versions

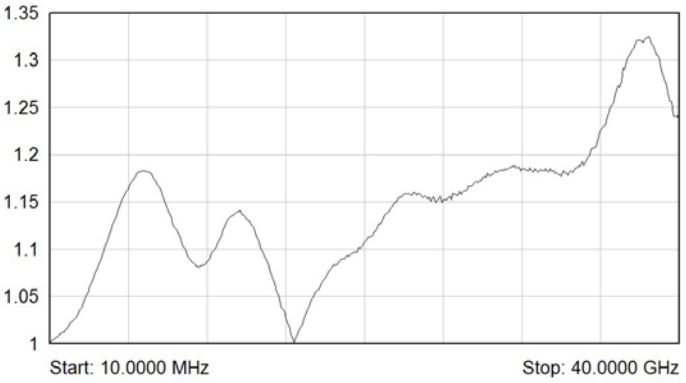
Characteristic Impedance:	50 Ω
Connectors:	SMA 2.9
Bandwidth	DC to 40 GHz
Maximum RF Carry Power:	60 W (0-3 GHz) 35 W (3-8 GHz) 30 W (8-12.4 GHz) 25 W (12.4-18 GHz) 15 W (18-26.5 GHz) 5 W (26.5-40 GHz)
Isolation:	>80 dB (0-3 GHz) >70 dB (3-8 GHz) >60 dB (8-12.4 GHz) >60 dB (12.4-18 GHz) >55 dB (18-26.5 GHz) >45 dB (26.5-40 GHz)
Insertion Loss:	<0.2 dB (0-3 GHz) <0.3 dB (3-8 GHz) <0.4 dB (8-12.4 GHz) <0.5 dB (12.4-18 GHz) <0.7 dB (18-26.5 GHz) <1.1 dB (26.5-40 GHz)
VSWR:	<1:1.2 (0-3 GHz) <1:1.3 (3-8 GHz) <1:1.4 (8-12.4 GHz) <1:1.5 (12.4-18 GHz) <1:1.7 (18-26.5 GHz) <1:2.2 (26.5-40 GHz)
Expected Life (low power):	>2 million operations per position guaranteed (typically >5 million)
Insertion Loss Repeatability:	Within 0.05 dB



Typical Insertion Loss (dB) - 40 GHz Versions



Typical Isolation (dB) - 40 GHz Versions



Typical VSWR - 40 GHz Versions

Switching Specification

Relay Manufacturer:	Radiall
Configuration:	SP6T or SP4T Microwave Multiplexer with 1, 2 or 3 independent banks.
LED Indicators:	Multiplexers have blue LEDs to indicate a closed RF path (failsafe versions only).
Operate Time:	Typically <10.5 ms
Maximum Cold Switch Voltage:	100 V
Maximum Carry Current:	1 A

Power Requirements - 40-784B Failsafe Versions

+3.3 V	+5 V	+12 V	-12 V
0.13 A	0.01 A	0.75 A	0

Power Requirements - 42-784B Failsafe Versions

+3.3 V	+12 V
0.36 A	0.95 A

Power Requirements - 40-784B Latching Versions

+3.3 V	+5 V	+12 V	-12 V
TBD	TBD	TBD	0

Power Requirements - 42-784B Latching Versions

+3.3 V	+12 V
TBD	TBD

Mechanical Characteristics

Front panel mounted multiplexers:

- 40-784B single, dual and triple versions
  - Dual slot 3U PXI (CompactPCI card)
- 42-784B single, dual and triple versions
  - Dual slot 3U PXIe, compatible with PXIe hybrid slot

Remote mounted multiplexers:

- 42-784B remote mounted versions
  - Single slot 3U PXIe, compatible with PXIe hybrid slot
- 40-784B remote mounted versions
  - Single slot 3U PXI (CompactPCI card)

Remote mounted multiplexer 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

40-784B - PXI bus via 32-bit P1/J1 backplane connector.

42-784B - PXIe bus via XJ3 and XJ4 backplane connectors.

Signals via front panel mounted coaxial connectors:

- 6 GHz versions - 50 Ω SMA 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.

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]-784B-[B][C][D][E][F]

Interface **0** = PXI **2** = PXIe	**Actuator Type** **[Blank]** = Failsafe **-LA** = Latching
Type **0** = SP6T 50 Ω **1** = SP4T 50 Ω	**Options** **[Blank]** = Panel Mount **-E** = Remote Mount
Frequency **0** = 6 GHz (SMA) **2** = 18 GHz (SMA) **3** = 26.5 GHz (SMA) **4** = 40 GHz (SMA 2.9)	**Quantity** **1**, **2** or **3** for Panel Mount **1**, **2** or **3** for Remote Mount

Example part numbers:

A PXI dual, SP6T 40 GHz, failsafe, panel mounted module would require part number **40-784B-042**
A PXIe triple, SP4T 18 GHz, latching, remote mounted module would require part number **42-784B-123-E-LA**

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-784B 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.

Accessories:
Microwave relay bracket for remote mounting:

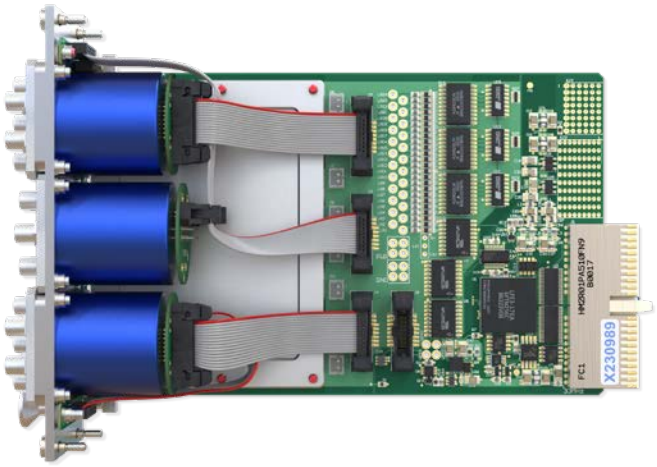
Bracket for 40-784B-xxx-E	40-784B-001-E-MB

Note: A single relay is mounted to each bracket, see user manual for details. To mount more than one relay, order multiples of the required part number.

Custom Configurations

Pickering can also offer mixed configurations of SP4T and SP6T multiplexers with a mix of bandwidths as outlined in the table below. Please contact the sales office with your requirements.

	Frequency	Configuration
MUX Position 1	6 GHz, 18 GHz, 26.5 GHz or 40 GHz	SP4T or SP6T
MUX Position 2	6 GHz, 18 GHz, 26.5 GHz or 40 GHz	SP4T or SP6T
MUX Position 3	6 GHz, 18 GHz, 26.5 GHz or 40 GHz	SP4T or SP6T



Side View of the PXI Triple Panel Mounted Microwave Multiplexer

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.

42-784B-023 PXIe Triple SP6T
Microwave Multiplexer

PXI & CompactPCI Compliance - 40-784B

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 - 42-784B

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-784B 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

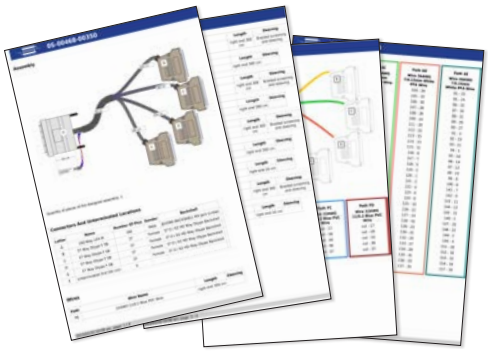
Breakouts

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



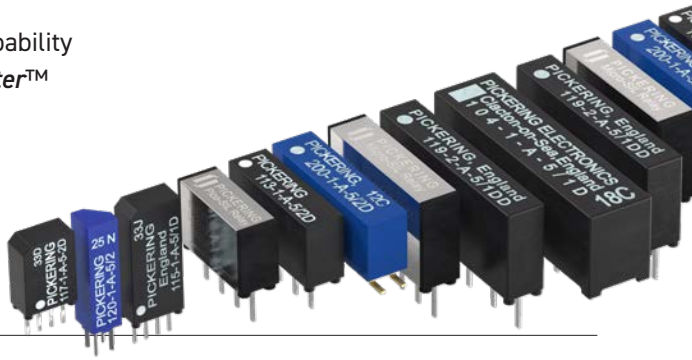
Mass Interconnect

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 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, Simulink**
- **Marvin** ATEasy
- **MTQ Testsolutions** Tecap Test & Measurement Suite
- **Python**

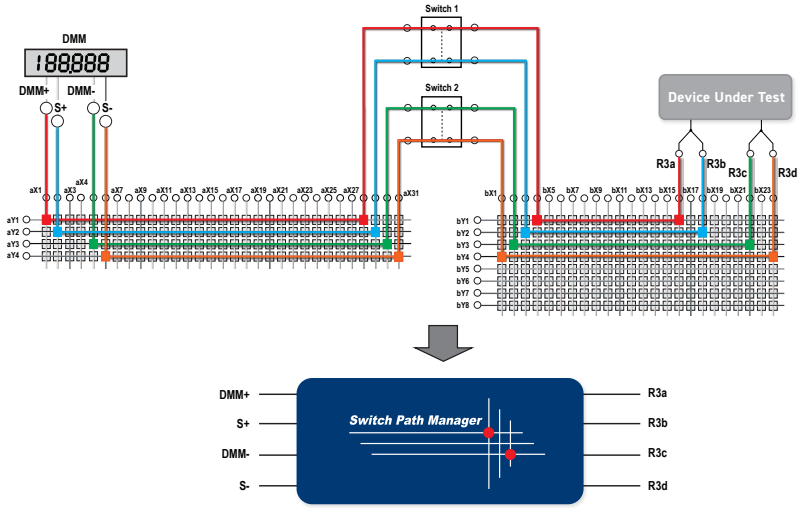
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries. We provide Soft Front Panels (SFPs) for our products for familiarity and manual control, as well as comprehensive documentation and example programs to help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