# Pickering RF & Microwave Switching Map - 2016

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Pickering Interfaces

| | 500MHz | L 1GHz | S 2.5GHz | S 3GHz | C 6GHz | X | Ku 18GHz | K 26.5GHz | Ka 40GHz | V 65GHz |
|---|---|---|---|---|---|---|---|---|---|---|
| **SPDT Switches** | 500MHz x9 or x17 **40-754** | 1GHz x4 **40-710**; 1.2GHz x9 or x17 **40-754** | 2.5GHz x4 **40-710**; 2.5GHz x1, x2, x3 or x4 **40-780A** | 2.7GHz x3 or x6 **40-830**; 3GHz x3 or x6 **40-870** | 10MHz - 6GHz x2, x4, x6 or x8 **40-880** | 12.4GHz x1 or x2 **40-780A** | 18GHz x1, x2, x3 or x4 **40-780A**; 18GHz x1 or x2 **40-781** | 26.5GHz x1, x2, x3 or x4 **40-780A** | 40GHz x1, x2, x3 or x4 **40-780A** | 50GHz x1, x2, x3 or x4 **40-780A**; 65GHz x1, x2, x3 or x4 **40-780A** |
| **4 to 1 Multiplexers** | 500MHz 5 or 10 banks **40-755**; 600MHz, 1, 2, 4 or 8 banks Unterminated: **40-760** Terminated: **40-761** | 1 or 1.3GHz 4 banks **40-749**; 1.8GHz 5 or 10 banks **40-755**; 1 or 2GHz 1 bank **40-745**; 1 or 2GHz 1 bank **40-740**; 2GHz 2 banks **40-746** | | 3GHz, 1, 2 or 4 banks **40-832**; 3GHz, 1, 2 or 4 banks **40-872**; 3GHz, 1 or 2 banks, terminated channels **40-873**; 3GHz, 1, 2, or 4 banks, terminated common **40-876** | 10MHz - 6GHz 1, 2, 3 or 4 banks **40-882**; 6GHz 1, 2 or 3 banks **40-784A** | | 18GHz 1, 2 or 3 banks **40-784A** | 26.5GHz 1, 2 or 3 banks **40-784A** | 40GHz 1, 2 or 3 banks **40-784A** | |
| **6 to 1 Multiplexers** | | | 2.5GHz 4, 8, 12 or 16 banks **60-820**; 2.5GHz 1 or 2 banks panel mount 1, 2 or 3 banks remote mount **40-785B**; Separate microwave relay for use with remote mount versions of 40-785B | | 10MHz - 6GHz 1 or 2 banks **40-881**; 6GHz 1, 2 or 3 banks **40-784A** | | 18GHz 1, 2 or 3 banks **40-784A**; 18GHz 1 or 2 banks panel mount 1, 2 or 3 banks remote mount **40-785B**; 18GHz 4, 8, 12 or 16 banks unterminated 2, 4, 6 or 7 banks terminated **60-800**; 26.5GHz 1, 2, or 3 banks **40-784A**; 26.5GHz 1 or 2 banks panel mount 1, 2, or 3 banks remote mount **40-785B**; 26.5GHz 2, 4, 6 or 7 banks Terminated **60-800** | 40GHz 1, 2 or 3 banks **40-784A**; 40GHz 1 or 2 banks panel mount 1, 2 or 3 banks remote mount **40-785B** | 40GHz 16 banks **60-800** |
| **8 to 1 Multiplexers** | 600MHz, 1, 2 or 4 banks Unterminated: **40-762** Terminated: **40-763** | 1GHz or 2GHz 2 banks **40-748**; 2GHz 1 bank **40-745** | | 3GHz 1 or 2 banks **40-834**; 3GHz 1 or 2 banks **40-874** | 10MHz - 6GHz 1 bank **40-883** | | | | | |
| **16 to 1 Multiplexers** | 600MHz, 1 or 2 banks Unterminated: **40-764** Terminated: **40-765** | 1GHz 1 bank **40-747** | | 3GHz 1 bank **40-835**; 3GHz 1 bank **40-875** | 10MHz - 6GHz 1 bank **40-883** | | | | | |
| **Other Switches** | Data MUXs, up to 450MHz, Differential 32:1: **40-736** USB 16 to 1: **40-737**; 32 to 1 MUX, 600MHz, 1 bank Unterminated: **40-766** Terminated: **40-767** | 12 to 1 MUX, 1GHz, 1 or 2 banks **60-722**; 24, 48, 72, 96, 120 or 144 to 1 MUX, 1GHz, 1 bank **60-721A** | | Programmable Attenuator 3GHz, single or dual **41-180** | Programmable Attenuator 10MHz - 6GHz, triple or hex **41-182** | | Transfer Switch 18GHz, single or dual **40-782A** | Transfer Switch 26.5GHz, single or dual **40-782A** | Transfer Switch 40GHz, single or dual **40-782A** | |
| **Matrices** | 250MHz or 300MHz 12x8 **40-726A**; 100MHz or 300MHz 16x4 **40-727** 16x2 **40-728** 8x4 **40-729**; 250MHz or 500MHz 8x9 **40-725**; 150MHz or 500MHz 8x9 **50-725**; 500MHz 16x16 **45-720A**; 50MHz, single or dual 24x8 **60-711**; 100MHz, single or dual 24x8 **60-760** | 1.5GHz 8x2 **40-750** | 2.5GHz single or dual 2x2 **40-837**; 2.5GHz single or dual 2x2 **40-877**; Up to 500MHz, Modular Matrix User Configurable 24x8 - 104x8 or 24x16 - 104x16 **65-110A**; 1GHz 32x16, 24x16 or 16x16 **60-730** 32x8, 24x8, 16x8 or 8x8 **60-731** 32x4, 24x4, 16x4 or 8x4 **60-732** | 2.5GHz 32x16, 24x16 or 16x16 **60-770** 32x8, 24x8, 16x8 or 8x8 **60-771** 32x4, 24x4, 16x4 or 8x4 **60-772** | 10MHz - 6GHz 4x4 **40-884** | | 10GHz single 3x3, 4x4, 8x4 or dual 3x3, 4x4 **60-750** | 20GHz 3x3, 4x4 **60-751** | | |

## PXI

All 40- and 41- series modules are PXI compliant and can be fitted into any of our PXI chassis as well as PXI and PXIe Hybrid chassis from other vendors. These modules can also be used in our 2, 7 or 18-slot LXI Modular Chassis.

## LXI

60- series products are LXI compliant high-density switches with Ethernet control—allowing remote control over a network using any computer with a web browser.

Also available in our LXI range are our LXI Modular Chassis. These chassis allow PXI switching modules to be controlled via Ethernet. Shown below is our 7-slot chassis.

## Additional Information

For more information and pricing for our RF and Microwave switching solutions as well as all other switching and simulation products, please refer to our website: **pickeringtest.com**

For technical specifications, you can download product data sheets from the website or request information from your local Pickering sales office.

You can also visit our Support Knowledgebase for additional information such as software drivers, product comparisons and technical support information: **pickeringtest.com/knowledgebase**

## Key

- 50 — 50Ω Characteristic Impedance
- 75 — 75Ω Characteristic Impedance
- T — Terminated versions available
- L — Loop-Thru available – allows the easy expansion of a matrix
- S — Solid State switching technology – gives high switching speed and long service life. **Note:** These switches are AC coupled and have a lower frequency limit of 10MHz.
- Hyperlink - click or tap for product information.

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# Pickering RF & Microwave Switching Map - 2016

## Switching & Simulation Solutions from Pickering Interfaces

### About Pickering Interfaces

Pickering designs and manufactures modular signal switching and simulation for use in electronic test and verification—offering the largest range of switching for PXI, LXI Ethernet and PCI applications in the industry. Our expanding range enables us to give you the right amount of switching with the required performance at the right cost.

### PXI From Pickering Interfaces

Pickering is a leading manufacturer of PXI switching & simulation modules, first entering the market in 1998. We now offer the widest range available—over 1,000 PXI modules, we can help you with your test and measurement requirements.

- Modules vary from our BRIC high-density switching matrix, RF & Microwave, and optical switching products through to standard and precision resistor simulation modules for sensor emulation.
- All modules come with a standard 3-year warranty.
- We are a Sponsor Member of the PXI Systems Alliance.

### PCI From Pickering Interfaces

Our PCI cards are built using the same basic technology as our acclaimed PXI module range, utilizing the same software drivers, soft front panels and control electronics. They are 100% software compatible allowing users to migrate from PXI to PCI or from PCI to PXI as required by the application. Our range of PCI cards includes:

- General Purpose Relay
- Matrices including High Density & RF
- Multiplexers including High Voltage
- Programmable Resistors
- Relay Drivers and Digital I/O
- Function Generators

### LXI From Pickering Interfaces

We were early adopters of the LXI standard as a means of providing a standardized interface for Ethernet (LAN) controlled instruments. We offer a wide range of LXI-based switching solutions.

- Low frequency, high density matrices, RF/microwave matrices and multiplexers, optical switching and modular switching chassis.
- Custom switching solutions – existing products can be adapted to meet a specific requirement or a completely custom solution created.
- We are Strategic Member of the LXI Consortium.

Pickering is the **only PXI & PCI switch provider with in-house reed relay manufacturing capability.** These instrument grade reed relays feature ***SoftCenter***® technology, ensuring long service life and repeatable contact performance (for further information visit pickeringrelay.com). In addition, most of our switch modules use through-hole technology relays (as opposed to surface mount) allowing easy replacement without the need for special tools.

### Product Customization

We can also quickly develop custom solutions. Our products are designed and manufactured on our own flexible manufacturing lines, giving complete product control and enabling simple customization to meet very specific requirements. Please contact your local sales office to discuss.

### Long-Term Product Support

Our extensive switching experience and the fact that all of our critical components, software and cabling designs and manufacturing processes are done in-house enables us to provide you with long-term support, typically 15-20 years for many products.

**Our PXI modules** operate in any PXI or PXIe Hybrid Chassis available from Keysight, NI, Marvin Test Solutions, ADLINK, Pickering and Teradyne/LitePoint.

**Hardware Compatibility**

Our PCI Cards are compatible with Specification 2.0 of the PCI standard and operate with a 33MHz 32-bit bus using either +5V or universal signalling (see individual card data sheets for details).

**LXI Ethernet Modular Chassis**

These chassis are capable of hosting our extensive range of 3U PXI switching and test & measurement modules in an LXI environment, allowing remote control over a gigabit Ethernet connection. Available in 2, 7 or 18-slot versions.

**Software Compatibility**

Our switching module and card drivers are compatible with all popular software: Windows 10/8/7/Vista/XP, Visual Studio (VB.NET, C#, C/C++), LabVIEW, LabVIEW RT, LabWindows/CVI, IVI, NISE, Keysight VEE, Mathworks Matlab, Marvin Test ATEasy and our Switch Path Manager.

### Accessories

Our PXI, PCI and LXI product ranges are fully supported by an extensive range of breakouts, cables and connectors that are outlined in the Cable & Connectors map and catalog. By utilizing our connection solutions, you are able to minimize the time required to specify your test system.

**Cables & Connectors Catalog**

Details the available cable and connector options we can supply for any product in our PXI, PCI and LXI ranges - 250 pages.

**Cables & Connectors Map**

Outlines the range of cable and connector options available for PXI, PCI and LXI products.

### Additional product literature available

**The Big PXI Catalog**

Details our full range of PXI modules and support products - over 500 pages.

**The PXI Module Map**

A fold-out selection guide to all our 1,000+ PXI modules.

**PXImate**

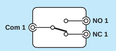
Our 80-page book explaining PXI basics providing useful data for engineers working on test systems.

**LXImate**

This 122 page book provides a practical overview of the LXI standard and explains how to communicate with your LXI device.

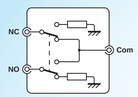
**All literature can be ordered from one of our sales offices or downloaded from pickeringtest.com/resources/literature**

## RF & Microwave Switching Architectures



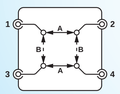

**SPDT RF/Microwave Switch (40-780A)**

The default condition of an SPDT switch is with the Com (common) connected to the NC (normally closed) terminal. When energized, Com is disconnected from NC and connected to the NO (normally open) terminal.




**RF/Microwave Terminated Switch (40-781)**

A terminated switch operates in the same way as a conventional SPDT switch. The difference is that the unused terminal is routed to ground via a terminating resistor.

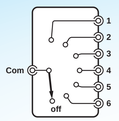



**RF/Microwave Transfer Switch (40-782A)**

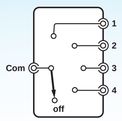
A transfer switch has a default "A" position and an energized "B" position. In the A position there are connections between terminals 1 - 2 and 3 - 4. When energized, the connections move to 1 - 3 and 2 - 4. This architecture allows test equipment to be inserted into a signal path or bypassed.


**RF Programmable Attenuator (41-182)**

Programmable attenuators consist of a chain of attenuator pads with bypass switches. In the default condition all the bypass switches are closed giving zero attenuation. Combinations of switches are enabled placing the required pads into the signal path giving an overall attenuation figure.

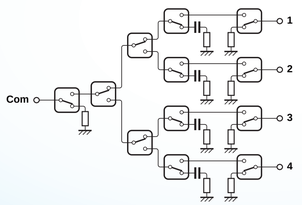



**6 to 1 Microwave Multiplexer (40-784A & 40-785B)**



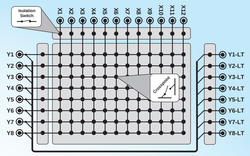

**4 to 1 Microwave Multiplexer (40-784A)**

Microwave multiplexers have a maximum frequency of operation up to 40GHz and are available in 4 to 1 and 6 to 1 formats. The default condition is with the Com terminal in the "off" position and, when activated, any one of the channel terminals can be routed to Com. Terminated versions are also available where channel terminals are automatically connected to ground via a terminating resistor when not in use.



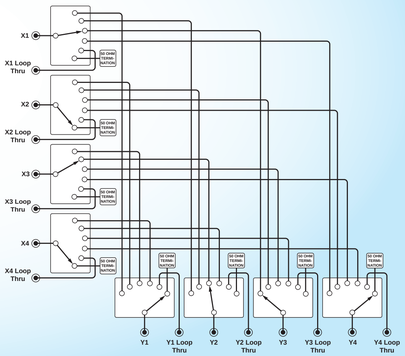

**4-Channel Terminated RF "Tree" Multiplexer (40-760 range)**

Tree multiplexers are constructed from discrete SPDT relays arranged in a symmetrical format to ensure all signal paths are the same length. Multiplexers using electro-mechanical relays have a maximum frequency of up to 3GHz and those using solid state relays can operate up to 6GHz. Driver software enables the correct sequence of relays to route a signal between the Com and the required channel terminal. The default condition is with a signal path enabled. Some modules include isolation switches or termination switches on the Com and/or the channel terminals.




**RF Crosspoint Matrix with Y loop-thru (40-726A)**

Crosspoint Matrices use SPST relays at each connection point to form X to Y signal paths. PCB layouts are carefully optimized for the best RF perfomance and isolation relays are included in most designs. Optional loop-thru connections allow expansion to create larger matrices.



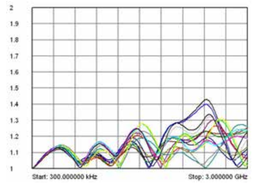

**4x4 Microwave Matrix with termination & loop-thru constructed using 6 to 1 multiplexers (60-750)**

Matrices made from interconnected multiplexers can have a much higher bandwidth than crosspoint matrices. The switching elements can be tree multiplexers or separate microwave multiplexers. This architecture is limited to X to Y signal paths.

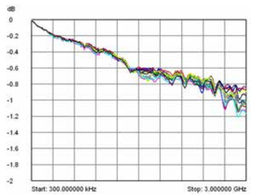
## RF Performance Measurements

**Typical performance plots for an RF switching module**

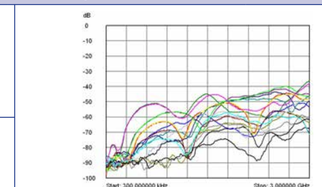
The data sheets for our RF and microwave modules include performance plots which are created from real measurement taken from sample products. These are designed to help the user assess the effect of using the product in their RF system. A switching module usually has multiple paths, sometimes too many to effectively show on a single graph. In these cases best and worse results are shown to indicate actual performance. Example plots from a 40-876 4-bank 4 to 1 Multiplexer are shown below.



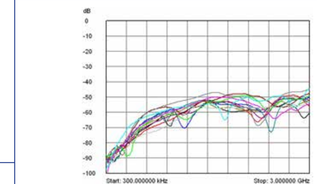

**VSWR Plot** - This is created by terminating the output of the switch with the characteristic impedance and inserting a range of frequencies into the input. The amount of signal reflected back to the input is calculated as a ratio. In a perfect system, all the input power would be transferred into the termination giving a VSWR of 1:1. Typically a switch is usable with a VSWR of up to 1.5:1 for a given frequency.




**Insertion Loss Plot** - This is a measurement of how much power is lost through a switch. A range of frequencies is inserted at the input and the level at the output is measured and plotted as dB below the input. In an ideal system this would be zero, but in practice consistency between paths is important. Careful RF design practices ensure that each switch path of a module has a similar amount of loss.




**Isolation Plot** - This is a measurement of the amount of signal that is transferred from the input to the output of a switch with that particular path disabled or in the "off" condition.




**Crosstalk Plot Between Ports** - In this case signals are applied to the input of a switch path with a terminated output. The signals picked up by the unused channels within the same switch bank are measured.

### 60-104 2-Slot USB/LXI Modular Chassis

The 60-104 is a 2-slot LXI chassis for Pickering PXI modules and is suitable for desk or rack mounting featuring remote control via USB or Ethernet. Remote control over a network enables the switching function of a test system to be located as close as possible to the target equipment. This can be of particular benefit in RF systems allowing cabling to be kept as short as possible, reducing costs and maximizing performance.

## Comprehensive Range of RF & Microwave Connectors & Cables

**Connector Types Used on Pickering RF & Microwave Modules**

### SMB Connector

This is a push-fit connector with a small outline making it suitable for high density RF switching. It typically has a maximum frequency of 4GHz and is used on many of our 3GHz PXI switches and multiplexers. It is available in 50Ω and 75Ω versions.

### SMA Connector

This is a threaded connector with a larger size than SMB or MCX connectors. It has a higher performance and is used on many of our of 50Ω switching modules with a maximum frequency of up to 18GHz. The SMA-2.9 variant of the connector is used on our 26.5GHz and 40GHz microwave multiplexers.

### MCX Connector

This is a push-fit connector with a similar size to the SMB connector. It has a higher maximum frequency of typically 6GHz and is offered as an alternative to SMB on many of our switches and multiplexers. It is available in 50Ω and 75Ω versions.

### F-Type Connector

This is a threaded connector with a larger size than SMA. It has an impedance of 75Ω and is widely used in video and broadcast applications. It has a frequency range greater that 2GHz and is used on our 60-721A and 60-722 LXI multiplexers as well as our 60-730/731/732 LXI matrices.

### MS-M Connector

This is a multi-way connector with an impedance of 50Ω and maximum frequency of 500MHz. Its small footprint makes it suitable for single slot high-density RF modules such as our 40-754 17x SPDT switch and 40-755 10 bank 4 to 1 multiplexer.

### Other Connectors

Selected modules are available with alternative connector types such as BNC, SMZ, 1.0/2.3 and 1.6/5.6. If you have a particular connector requirement, please contact you local Pickering sales office.

**RF & Microwave Cable Assemblies**

**We support all of our RF and microwave switching products with a wide range of cabling options allowing easy integration into your test system.**

**The range of coaxial cables available includes:**

- BNC to BNC 50Ω
- SMB to SMB 50Ω
- SMA to SMA 50Ω
- µWave SMA to µWave SMA 50Ω
- MCX to MCX 50Ω
- SMB to BNC 50Ω
- SMB to SMA 50Ω
- F type to SMA 50Ω
- MS-M multi-way to SMB 50Ω
- MS-M multi-way to unterminated 50Ω
- BNC to BNC 75Ω
- SMZ/type43 to SMZ/type43 75Ω
- 1.0/2.3 to 1.0/2.3 75Ω
- Mini SMB to Mini SMB 75Ω
- MCX to MCX 75Ω
- F type to F type 75Ω
- 1.6/5.6 to 1.6/5.6 75Ω
- Mini SMB to BNC 75Ω
- Mini SMB to SMZ/type43 75Ω
- Mini SMB to 1.0/2.3 75Ω

All cables are available in 0.1m, 0.25m, 0.5m, 1m or custom lengths.

### Custom Cable Assemblies

We can manufacture and supply custom RF cables, if you do not see what you need then contact your Pickering sales office with your requirements and let us solve your RF connection problem.



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## RF & Microwave Module Map

- RF Switching to 6GHz with Microwave to 65GHz
- 6GHz Solid State
- Matrices
- MUXs
- SPDT Switches
- Attenuators
- Cable Assemblies

Pickering's RF & Microwave Module Map is a single-sheet reference to over 300 modules in PXI, PCI and LXI formats, including their basic specifications and cabling options.

3 Year Warranty

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RF & Microwave Module Map

Pickering's PXI Switching modules can be used in both PXI and Ethernet LXI Chassis and LED indicators are available on many modules.

需要详细资料？请现在通过 sales@hkaco.com 联系我们。

北京 010-5781 5040 | 上海 021-6728 2707 | 西安 029-8187 3816
广州 400-999-3848 | 成都 028-6138 2617 | 沈阳 024-8376 9335
深圳 0755-2267 7441 | 武汉 027-8193 9100 | 香港 852 6749 9159

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