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40-785A User Manual

PXI Microwave Multiplexer Modules



PXI

Issue 3.5 September 2022

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ISO 9001
Reg No. FM38792

WARNING

Only the correct SMA connector series should be mated with these modules. The 40-785A range uses SMA-3.5, SMA-2.9 & SMA-1.8 connectors for 40, 50 & 65GHz respectively, and the user should only mate the correct type to the module, failure to do so may result in damage to the connector.

Also, it is important that the SMA connector's nut is properly tightened to the correct torque with a 5/16 inch wrench. This should be 3-5 in·lbs (0.3 to 0.6 N·m) for brass, and 7-10 in·lbs (0.8–1.1 N·m) for stainless steel connectors.

TECHNICAL SUPPORT

For Technical Support please contact Pickering Interfaces either by phone, the website or via e-mail.

WARRANTY

All products manufactured by Pickering Interfaces are warranted against defective materials and workmanship for a period of three years, excluding programmable power supplies, from the date of delivery to the original purchaser. Any product found to be defective within this period will, at the discretion of Pickering Interfaces be repaired or replaced.

Products serviced and repaired outside of the warranty period are warranted for ninety days.

Extended warranty and service are available. Please contact Pickering Interfaces by phone, the website or via e-mail.

ENVIRONMENTAL POLICY

Pickering Interfaces operates under an environmental management system similar to ISO 14001.

Pickering Interfaces strives to fulfil all relevant environmental laws and regulations and reduce wastes and releases to the environment. Pickering Interfaces aims to design and operate products in a way that protects the environment and the health and safety of its employees, customers and the public. Pickering Interfaces endeavours to develop and manufacture products that can be produced, distributed, used and recycled, or disposed of, in a safe and environmentally friendly manner.

Worldwide Technical Support and Product Information

pickeringtest.com

Pickering Interfaces Headquarters

Stephenson Road Clacton-on-Sea CO15 4NL United Kingdom
Tel: +44 (0)1255-687900
E-Mail: sales@pickeringtest.com

USA
Tel: (West) +1 541 471 0700
Tel: (East) +1 781 897 1710
E-mail: ussales@pickeringtest.com

France
Tel +33 9 72 58 77 00
E-mail frsales@pickeringtest.com

Germany
Tel: +49 89 125 953 160
E-mail: desales@pickeringtest.com

Sweden
Tel: +46 340-69 06 69
E-mail: ndsales@pickeringtest.com

Czech Republic
Tel: +420 558 987 613
E-mail: desales@pickeringtest.com

China
Tel: +86 4008 799 765
E-mail: chinasales@pickeringtest.com

PRODUCT SAFETY

SAFETY SYMBOLS

The following safety symbols may be used on the product and throughout the product documentation.

MEANING / DESCRIPTION	SYMBOL
PROTECTIVE EARTH (GROUND) To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.	
DANGEROUS VOLTAGE To indicate hazards arising from dangerous voltages.	
WARNING / CAUTION An appropriate safety instruction should be followed or caution to a potential hazard exists. Refer to the relevant instructions detailed within the product manual.	
HEAVY If this product is heavy reference should be made to the safety instructions for provisions of lifting and moving.	
STATIC SENSITIVE To indicate that static sensitive devices are present and handling precautions should be followed.	

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WARNINGS AND CAUTIONS

WARNING - HAZARDOUS ENVIRONMENTS	SYMBOL
This product is not specifically designed for use in hazardous environments, for example in explosive atmospheres. If the product is to be used in hazardous environments we recommend that the user ensures suitable protective measures are taken.	

WARNING - DANGER OF ELECTRIC SHOCK	SYMBOL
This module may contain hazardous voltages. Before removing the module from the rack remove all supplies and disconnect user I/O signals. Unused slots in the host chassis are populated with blanking plates to prevent access to user I/O signals that may be present. Blanking panels are available to order from Pickering in a variety of slot widths. If the product is not used in this manner for example by using an extender card then additional care must be taken to avoid contact with exposed signals.	

CAUTION - HANDLING OF ELECTROSTATIC-SENSITIVE DEVICES	SYMBOL
Certain semiconductor devices used in this equipment are liable to damage due to static voltage. Observe the following precautions when handling these devices in their unterminated state, or sub-assemblies containing these devices: 1. Persons removing sub-assemblies from equipment using these devices must be earthed by a wrist strap and a resistor at the point provided on the equipment. 2. Soldering irons used during the repair operations must be low voltage types with earthed tips and isolated from the mains voltage by a double insulated transformer. 3. Outer clothing worn must be unable to generate static charges. 4. Printed Circuit Boards (PCBs) fitted with these devices must be stored and transported in anti-static bags.	

CAUTION - PRODUCT DOCUMENTATION	SYMBOL
Suitably qualified & trained users should ensure that the accompanying documentation is fully read and understood before attempting to install or operate the product.	

SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS
All cleaning and servicing requires the equipment to be isolated and disconnected from the power source and user I/O signals (refer to the Maintenance Section). • Appropriate manual handling procedures should be followed as dictated by the weight of the individual module or the combined weight of the modules & chassis. • Should a fault occur with the module or chassis, immediately isolate and disconnect the incoming power to the chassis and the user I/O signals. • Ensure the equipment is installed, operated and maintained by trained and authorised personnel. • For suitably equipped products in the event of an emergency press the red “emergency stop” button situated on the front of the unit.

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SECTION 1 - TECHNICAL SPECIFICATION



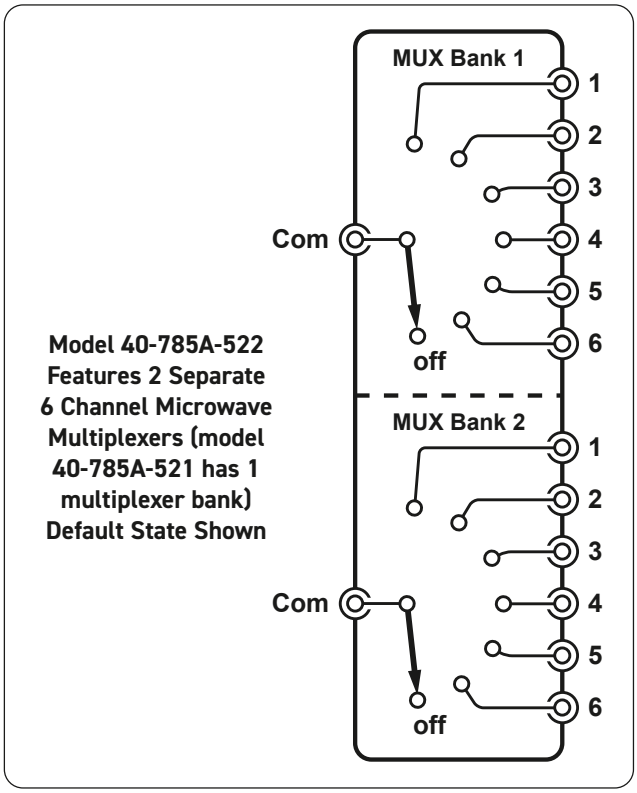
- Single or Dual 6 Channel Panel Mounted Multiplexer
- Up To 3 Remote Multiplexers From Single Slot Version
- 18 GHz, 26.5 GHz and 40 GHz Versions
- 50 Ω SMA Style Connectors
- 50 Ω Terminated Versions
- 75 Ω Version With 4GHz Bandwidth
- VISA, IVI & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- 3 Year Warranty

The 40-785A range of PXI microwave multiplexers are suitable for switching 50 Ω signals up to 40 GHz. They are available in single or dual 6 channel configurations, with relays mounted on the front panel. Remote versions are also available which can support up to three multiplexers in a single slot.

The remote multiplexer 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 1.5 m interface cable.

The panel mounted 50 Ω terminated version occupies 4 slots for the single version or 6 slots for the dual version.

A 75 Ω version is available with a bandwidth of 4 GHz and uses Siemens 1.6/5.6 style connectors.



Model 40-785A-522 Features 2 Separate 6 Channel Microwave Multiplexers (model 40-785A-521 has 1 multiplexer bank) Default State Shown

The 40-785A is suitable for constructing complex microwave switching networks and provides a range of switching configurations to suit most applications. Connection is by high performance front panel mounted SMA style connectors for 50 Ω versions.



Single slot version controls up to 3 remotely mounted microwave multiplexers via interface cables

These modules have the highest RF & 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.

Easy Repair

To allow fast in field repair, any relay may be replaced without removing the module from the PXI chassis.

Specification - 18 GHz Version

Characteristic Impedance:	50 Ω
Maximum Frequency:	20 GHz
Rise Time:	<3ps
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)
Isolation:	80 dB (0-3 GHz) 70 dB (3-8 GHz) 60 dB (8-12.4 GHz) 60 dB (12.4-18 GHz)
Non-Terminated Option Maximum Power Rating:	240 W (0-3 GHz) 150 W (3-8 GHz) 120 W (8-12.4 GHz) 100 W (12.4-18 GHz)
Expected Life (Low Power): Expected Life (Max Power):	$5x10^6$ ops. per position $3x10^5$ ops. per position
Terminated Option Maximum Power Rating:	120 W (0-3 GHz) 80 W (3-8 GHz) 60 W (8-12.4 GHz) 50 W (12.4-18 GHz)
Termination Power Rating:	1 W per termination, 3 W total per 6 channel multiplexer.
Expected Life (Low Power): Expected Life (Max Power):	$2x10^6$ ops. per position $3x10^5$ ops. per position
Maximum Voltage: Maximum Switch Current:	100 VDC 1 A
Initial On Path Resistance: Off Path Resistance:	<200 mΩ $>10^{10}$ Ω (unterminated)
Vibration:	Sine 1 mm, 5 - 60 Hz Sine 10 g 60 - 2000 Hz
Switching Time:	15 ms

Mechanical Characteristics

Front panel mounted versions occupy 3 slots, terminated front panel mounted versions occupy 4 (single) or 6 (dual versions) slots.

Remote multiplexer versions occupy one slot and 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.

Switching Specification - Un-terminated 26.5 GHz Version

Insertion Loss:	<0.7 dB
VSWR:	<1:1.7
Isolation:	>50 dB
Expected Life:	$5x10^6$ operations

Switching Specification - Terminated 26.5 GHz Version

Insertion Loss:	<0.7 dB
VSWR:	<1:1.7
Isolation:	>55 dB
Expected Life:	$>2x10^6$ operations

Additional Specification - 40 GHz Version

Insertion Loss:	<1.1 dB
VSWR:	<1:2.2
Isolation:	>50 dB
Expected Life:	$2x10^6$ operations

Additional Specification - 75 Ω Version

Insertion Loss:	<0.3 dB to 2.5 GHz, typically <1.5 dB to 4 GHz
VSWR:	<1:1.3 to 2.5 GHz typically <1:1.3 at 4 GHz
Isolation:	>70 dB to 2.5 GHz
Expected Life:	$2x10^6$ operations

Power Requirements

+3.3 V	+5 V	+12 V	-12 V
0	0.2 A	0.75 A	0

Connectors

PXI bus via 32-bit P1/J1 backplane connector.
Signals via coaxial connectors on microwave switches:

- 20 GHz & 26.5 GHz versions - SMA
- 40 GHz versions - SMA-2.9
- 75 Ω versions - 1.6/5.6 75 Ω connectors

Operating/Storage Conditions

Operating Conditions

Operating Temperature:	0 °C to +55 °C
Humidity:	Up to 90 % non-condensing
Altitude:	5000 m

Storage and Transport Conditions

Storage Temperature:	-20 °C to +75 °C
Humidity:	Up to 90 % non-condensing
Altitude:	15000 m

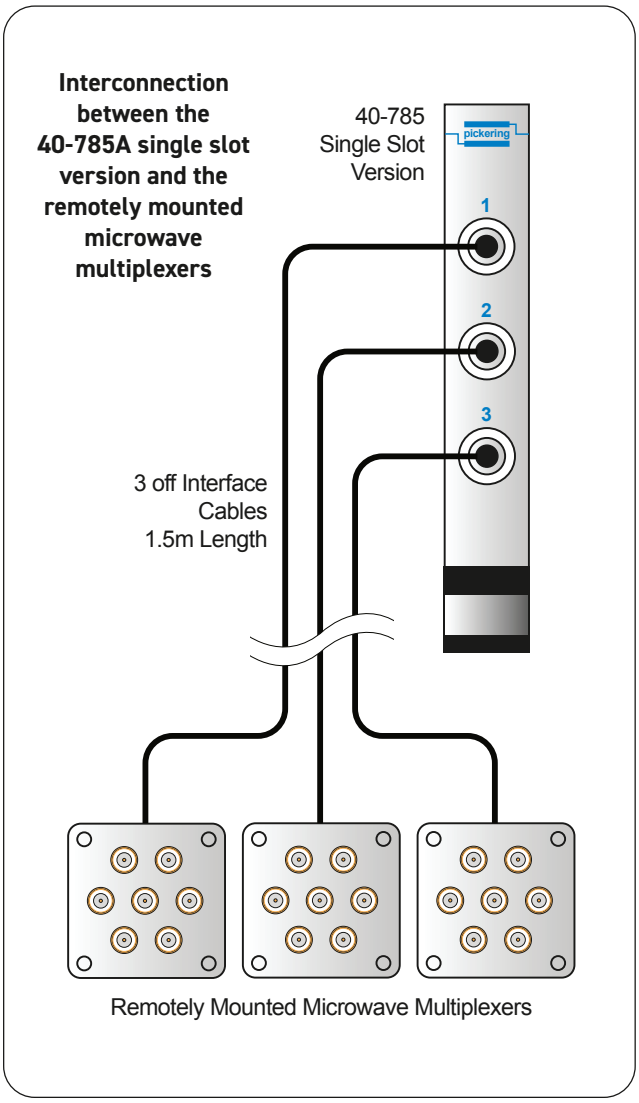
PXI & CompactPCI Compliance

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.

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.



Mating Connectors & Cabling

For connection accessories for the 40-785A range please refer to the 90-011D RF Cable Assemblies data sheet where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.

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.

Product Order Codes

18 GHz Multiplexer Versions - 50 Ω	
Single 6 Chan, Panel mount, 50 Ω SMA	40-785A-521
Dual 6 Chan, Panel mount, 50 Ω SMA	40-785A-522
Single 6 Chan, Panel mt, 50 Ω SMA, Term	40-785A-521-T
Dual 6 Chan, Panel mt, 50 Ω SMA, Term	40-785A-522-T
Single 6 Chan, Remote mount, 50 Ω SMA	40-785A-521-E
Dual 6 Chan, Remote mount, 50 Ω SMA	40-785A-522-E
Triple 6 Chan, Remote mount, 50 Ω SMA	40-785A-523-E
Single 6 Chan, Remote, 50 Ω SMA, Term	40-785A-521-TE
Dual 6 Chan, Remote, 50 Ω SMA, Term	40-785A-522-TE
Triple 6 Chan, Remote, 50 Ω SMA, Term	40-785A-523-TE
26.5 GHz Multiplexer Versions - 50 Ω	
† Single 6 Chan, Panel mount, 50 Ω SMA	40-785A-531
† Dual 6 Chan, Panel mount, 50 Ω SMA	40-785A-532
Single 6 Chan, Panel mt, 50 Ω SMA, Term	40-785A-531-T
Dual 6 Chan, Panel mt, 50 Ω SMA, Term	40-785A-532-T
Single 6 Chan, Remote mount, 50 Ω SMA	40-785A-531-E
Dual 6 Chan, Remote mount, 50 Ω SMA	40-785A-532-E
Triple 6 Chan, Remote mount, 50 Ω SMA	40-785A-533-E
Single 6 Chan, Remote, 50 Ω SMA, Term	40-785A-531-TE
Dual 6 Chan, Remote, 50 Ω SMA, Term	40-785A-532-TE
Triple 6 Chan, Remote, 50 Ω SMA, Term	40-785A-533-TE
40 GHz Multiplexer Versions - 50 Ω	
† Single 6 Chan, Panel mount, 50 Ω SMA-2.9	40-785A-541
† Dual 6 Chan, Panel mount, 50 Ω SMA-2.9	40-785A-542
Single 6 Chan, Panel mt, 50 Ω SMA-2.9, Term	40-785A-541-T
Dual 6 Chan, Panel mt, 50 Ω SMA-2.9, Term	40-785A-542-T
Single 6 Chan, Remote mount, 50 Ω SMA-2.9	40-785A-541-E
Dual 6 Chan, Remote mount, 50 Ω SMA-2.9	40-785A-542-E
Triple 6 Chan, Remote mount, 50 Ω SMA-2.9	40-785A-543-E
Single 6 Chan, Remote, 50 Ω SMA-2.9, Term	40-785A-541-TE
Dual 6 Chan, Remote, 50 Ω SMA-2.9, Term	40-785A-542-TE
Triple 6 Chan, Remote, 50 Ω SMA-2.9, Term	40-785A-543-TE
4 GHz Multiplexer Versions - 75 Ω	
Single 6 Chan, Panel mount, 75 Ω 1.6/5.6	40-785A-751
Dual 6 Chan, Panel mount, 75 Ω 1.6/5.6	40-785A-752
Single 6 Chan, Remote mount, 75 Ω 1.6/5.6	40-785A-751-E
Dual 6 Chan, Remote mount, 75 Ω 1.6/5.6	40-785A-752-E
Triple 6 Chan, Remote mount, 75 Ω 1.6/5.6	40-785A-753-E
Accessories:	
Microwave relay bracket for remote mounting - Contact Pickering Interfaces for information.	

† Please note that these models have been superceded with more competitive options from model 40-784, however remain available for legacy requirements.

Chassis Compatibility

This PXI module must be used in a suitable chassis. It is 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

Chassis Selection Guide



Standard PXI or hybrid PXIe Chassis from any Vendor:

- Mix our 1000+ PXI switching & simulation modules with any vendor's PXI 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 1000+ PXI Switching & Simulation 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

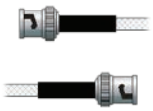
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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



Connectors & Backshells



Multiway Cable Assemblies



RF Cable Assemblies



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. Visit: pickeringtest.com/cdt to start your design.



Mass Interconnect

We recommend the use of a mass interconnect solution when an Interchangeable Test Adapter (ITA) is required for a PXI or LXI based test system. Our modules are fully supported by both 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, please go to: pickeringrelay.com



Programming
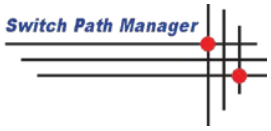
Pickering provide kernel, IVI and VISA (NI & Keysight) drivers which are compatible with all Microsoft supported versions of Windows and popular older versions. For a list of all supporting operating systems, please see: pickeringtest.com/os

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
- **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, please 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, please go to: pickeringtest.com/spm

Diagnostic Relay Test Tools



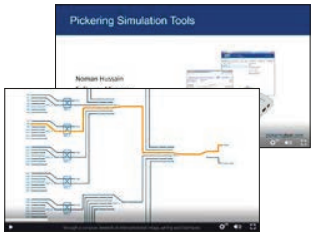
eBIRST Switching System Test Tools are designed specifically for our PXI, PCI or LXI products, these tools simplify switching system fault-finding by quickly testing the system and graphically identifying the faulty relay.
To learn more, please go to: pickeringtest.com/ebirst

Three Year Warranty & Guaranteed Long-Term Support

All standard products manufactured by Pickering Interfaces are warranted against defective materials and workmanship for a period of three years from the date of delivery to the original purchaser. Extended warranty and service agreements are available for all our modules and systems with various levels to suit 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, please go to: pickeringtest.com/support

Available Product Resources

We have a large library of product resources including success stories, product and support videos, articles and white papers as well as application specific product brochures to assist when looking for the switching, simulation and connection solutions you need. We have also published handy reference books on Switching Technology and for the PXI and LXI standards.









To view, download or request any of our product resources, please visit: pickeringtest.com/resources

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SECTION 2 - TECHNICAL DESCRIPTION

MECHANICAL DESCRIPTION

The Microwave Multiplexer Module conforms to the 3U height (128mm) Eurocard standard and comprises the following:

- CPCI Ejector Handle
- Three, four or six slot width Front Panel (single slot for the remote -E option)
- One or two Front Panel mounted Microwave Multiplexers (remotely located via cable with the -E option)
- 50Ω SMA signal connectors, or 75Ω 1.6/5.6 signal connectors
- Compact PCI backplane connector
- PCI Bridge (U1)
- Control Logic

The front panel is secured to the PCB by two M2.5 x 6mm pan-head posi-drive screws.



Figure 2.1 - 40-785A Microwave Multiplexer Module in Dual Bank Format



Figure 2.2 - 40-785A Microwave Multiplexer Module in Remote Format

FUNCTIONAL DESCRIPTION

A functional block diagram is provided in Figure 2.3. The Microwave Multiplexer Module is powered by +12V and +5V inputs via Compact PCI connector J1. The interface to the user test equipment is via the front panel mounted SMA connectors. The module comprises a PCB which provides mounting for control logic, and a front panel which provides mounting for the microwave relays (the remote -E option controls the relays via a 1.5m screened cable). The relays are energised via control signals from relay drivers U10 and U11. The relay drivers are addressed by PCI bridge U1, via output register U8, to output the required signal. PCI Bridge U1 is configured by EEPROM U2.

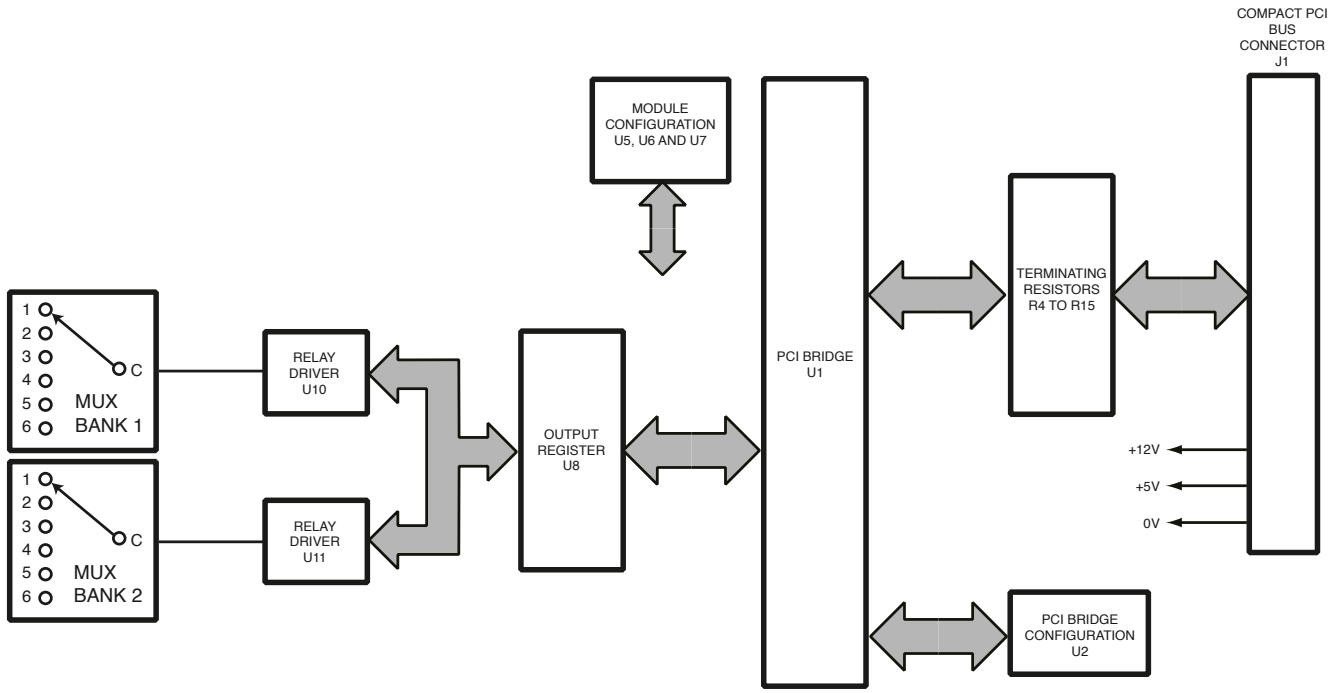


Figure 2.3 - Microwave Multiplexer Module 40-785A: Functional Block Diagram

SECTION 3 - INSTALLATION

Refer to the Warnings and Cautions at the front of this manual

Modular products require installation in a suitable PXI/LXI chassis. The module is designed for indoor use only.

PREOPERATION CHECKS (UNPACKING)

1. Check the module for transport damage and report any damage immediately to Pickering Interfaces. Do not attempt to install the product if any damage is evident.
2. Position the chassis relative to any other equipment the module(s) will connect with. Ensure the chassis is not connected to the electrical supply.
3. Ensure that the designated area for the chassis containing the module is of flat and solid construction to withstand and support the combined weight of the module(s) and chassis.

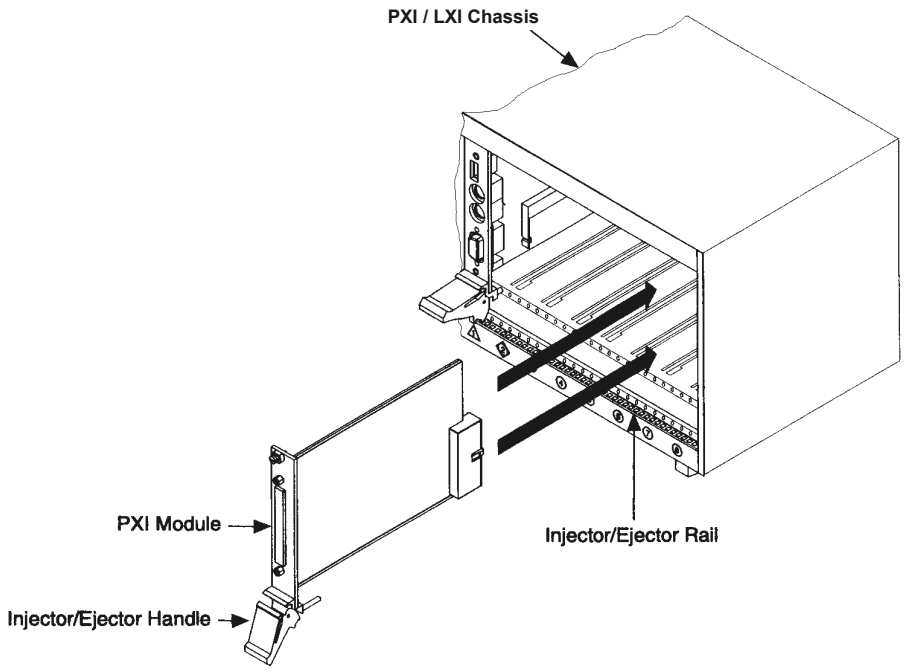


Figure 3.1 - Installing the Module into a PXI/cPCI/LXI Chassis

HARDWARE INSTALLATION
ELECTRICAL CONNECTION (CHASSIS)

1. The chassis must be electrically installed in accordance with local regional electrical codes by a qualified engineer.
2. The chassis must be grounded.

Electrostatic discharge can damage the components on the module. To avoid such damage in handling the board refer to page VII.

Ensure that there is adequate ventilation.

The module should be installed in accordance with the following procedure:

1. Ensure that the system is turned OFF but still connected to mains so that it remains grounded.
2. Choose an appropriate slot in the rack.
3. Remove the blanking plate for the chosen slot.
4. Ensure that the injector/ejector handle is in its downward position. Align the module with the card guides on the top and bottom of the slot.

   Do not raise the injector/ejector handle whilst inserting the module as the module will not insert properly.
5. Hold the handle whilst slowly sliding the module into the card guides until the handle catches on the injector/ejector rail (refer to Figure 3.1).
6. Raise the injector/ejector handle until the module firmly seats into the backplane. The front panel of the module should be flush with the front panel of the chassis.
7. Secure the front panel of the module using both screws to the chassis front panel mounting rails.
8. In a system employing a remote control interface to connect an external controller to a PXI chassis or to link multiple chassis, power-up the system as follows:
   a. For a system comprising an external controller and one chassis, power up the chassis before powering up the external controller.
   b. For a system comprising more than one chassis, turn ON the last chassis in the system followed by the penultimate, etc, and finally turn ON the external controller or chassis containing the system controller.
9. For Pickering Interfaces modular LXI installation there is no requirement to use any particular power up sequence.

SOFTWARE INSTALLATION

First install the appropriate Pickering PXI switch card drivers by running the installer program Setup.exe (provided in a compressed zip file), either from the CD-ROM supplied, or by downloading the latest version from our website **pickeringtest.com** - the recommended method. Setup is accompanied by a ReadMe file containing additional installation information. A single installation covers all cards in the System 40, System 45 and System 50 ranges.

When installation completes, the installed drivers' ReadMe file is offered for display. It can also be displayed later using a shortcut on the Programs>>Pickering menu.

If you are not a LabVIEW user you should choose the "full" version, and once that has been installed run the LabVIEW Runtime Engine installer via the shortcut on the Programs>>Pickering menu. In the absence of LabVIEW the Runtime Engine is required to support the Pickering Test Panels application.

TESTING OPERATION

After installation of the hardware and Pickering PXI Driver software package start the General Soft Front Panel (GSFP) using the desktop icon or via the Start menu (***Start Menu-> Pickering Interfaces Ltd -> General Soft Front Panel***).



Figure 3.2 - General Soft Front Panel Icon

A selector panel will appear, listing all installed Pickering PCI, PXI or LXI switch cards and resistor cards. Click on the card you wish to control, and a graphical control panel is presented allowing operation of the card. Panels can be opened simultaneously for all the installed cards.

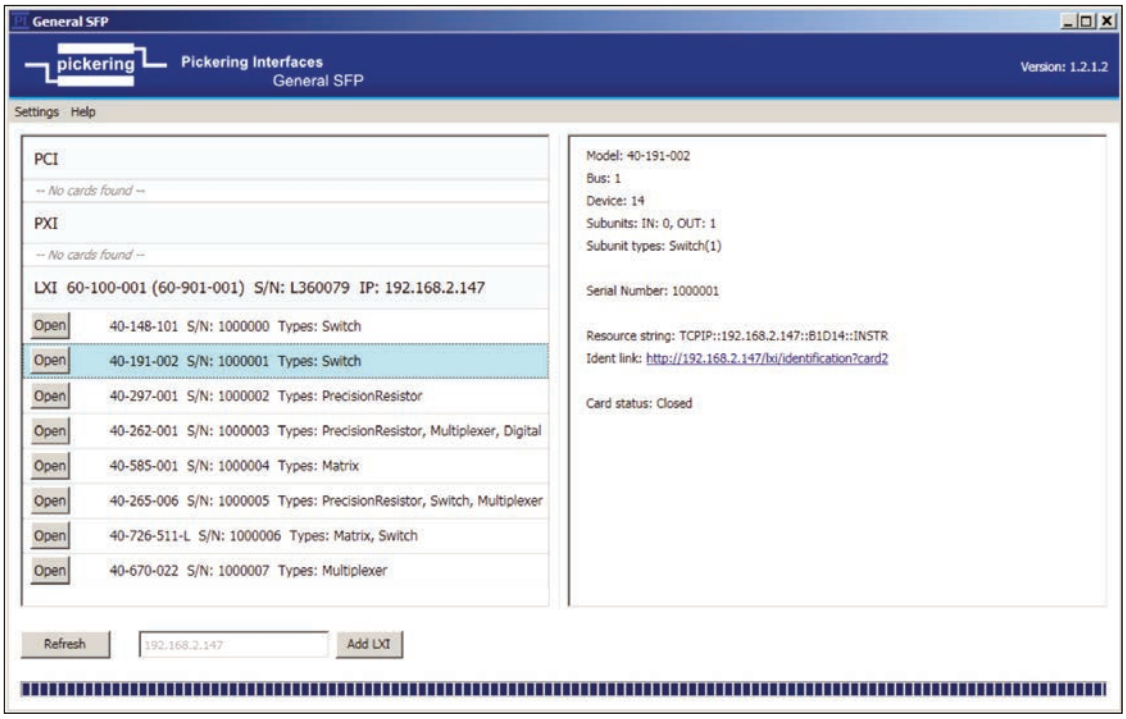


Figure 3.3 - General Soft Front Panel Selector

More details how to use the GSFP can be found in the manual, via menu ***Help\Manual***

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SECTION 4 - PROGRAMMING GUIDE

PROGRAMMING OPTIONS FOR PICKERING INTERFACES PXI MODULES

For information on the installation and use of drivers and the programming of Pickering's products in various software environments, please refer to the Software User Manual.

This is available as a download from:
https://www.pickeringtest.com/support/software-drivers-and-downloads

Also, it can be accessed from the DVD supplied with the product:
<DVD_DRIVE>\downloads\Documentation\Software-Manual.pdf

MODULE ARCHITECTURE

The 40-785A is a 6-channel microwave multiplexer available with one or two banks mounted on the front panel or one, two or three banks mounted remotely . In the default state, all channels are in the “off” position. Energising a particular channel number creates a signal path between the Com and the corresponding terminal number. Only one channel per bank can be energised at any one time. The relay module’s switching architecture is shown in the diagram below:

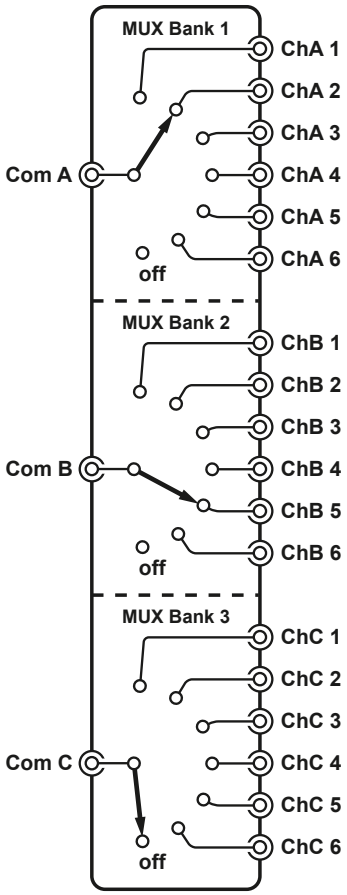


Figure 4.1 - The 40-785A Module Switching Architecture (3-Bank Version Only Available in Remote Format)

One sub-unit is used per bank to control the microwave multiplexer as shown below.

Sub Unit Number	Sub Unit Type	Description
1	MUX(6x1) + off	Microwave Multiplexer Bank 1
2	MUX(6x1) + off	Microwave Multiplexer Bank 2
3	MUX(6x1) + off	Microwave Multiplexer Bank 3

NOTE: The **40-785A-522-T-S1** is a special version of the dual 6-channel terminated microwave multiplexer where the software switches both Bank 1 and Bank 2 simultaneously. This creates a 6-channel, 1-bank, 2-pole multiplexer where the signal paths of both poles are switched with a single command.

PROGRAMMING THE MODULE

Here are examples of using the drivers with the 40-785A Multiplexer.

Using PILPXI

To enable a signal path the user could use the simple OpBit command

OpBit

```
DWORD sub_unit = 1;
PIL_OpBit( card_num, sub_unit, 1, 1);    // Enables the ComA to ChA1 signal path

PIL_OpBit( card_num, sub_unit, 2, 1);    // Releases the ComA to ChA1 signal path and
                                         // enables the ComA to ChA2 signal path

PIL_OpBit( card_num, sub_unit, 2, 0);    // Releases the ComA to ChA2 signal path and
                                         // sets the multiplexer to the off position
```

Using PIPX40

setChannelState

```
ViUInt32 sub_unit = 1;
pipx40_setChannelState(vi, sub_unit, 1, VI_ON);// Enables the ComA to ChA1 signal path

pipx40_setChannelState(vi, sub_unit, 2, VI_ON);// Releases the ComA to ChA1 signal path
                                               // and enables the ComA to ChA2 signal path

pipx40_setChannelState(vi, sub_unit, 2, VI_OFF); // Releases the ComA to ChA2 signal
                                    // path and sets the multiplexer to the off position
```

Using pi40iv

The IVI driver has no special labelling for this card and treats the array of switches as a simple array, labelling the channels using the normal com./ch labelling tags.

```
pi40iv_Connect(vi, comA, chA1);      // Enables the ComA to ChA1 signal path

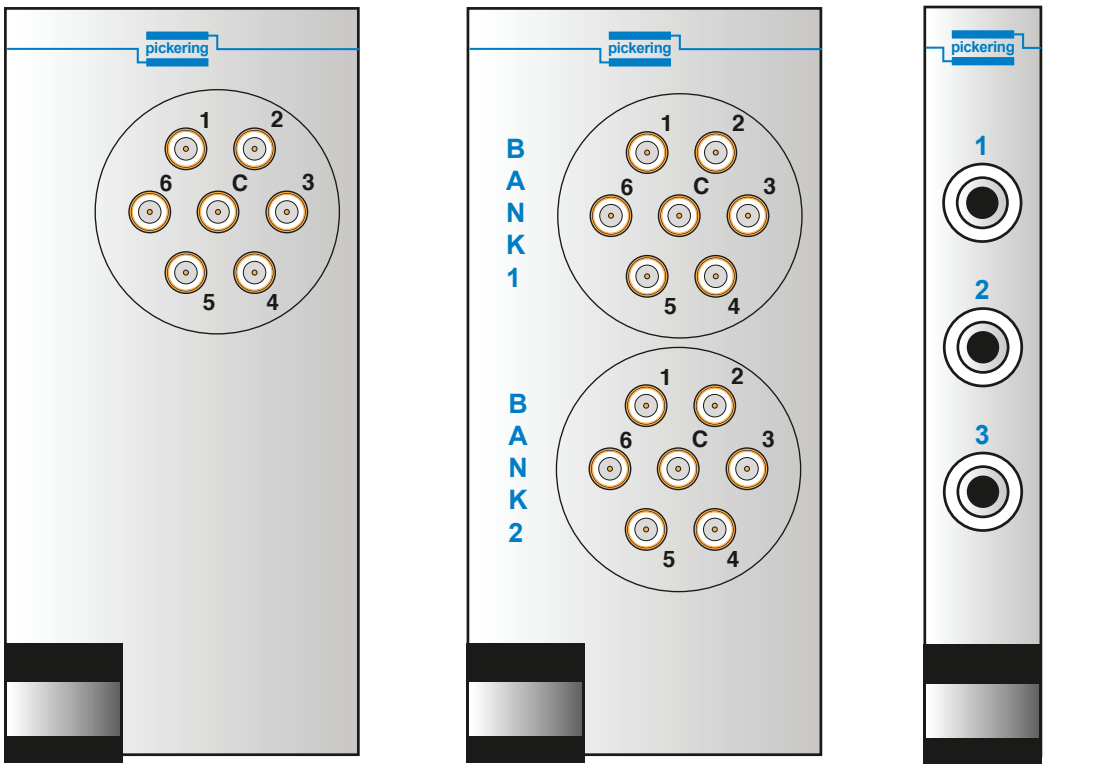
pi40iv_Disconnect(vi, comA, chA1);   // Releases the ComA to ChA1 signal path

pi40iv_Connect(vi, comA, chA2);      // Enables the ComA to ChA2 signal path

pi40iv_Disconnect(vi, comA, chA2);   // Releases the ComA to ChA2 signal path and
                                     // sets the multiplexer to the off position
```

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SECTION 5 - CONNECTOR INFORMATION



40-785A-521/751

40-785A-522/752

40-785A Remote Version (-E Suffix)

Figure 5.1 - Microwave Multiplexer Module 40-785A: Connector Positions

NOTE 1: **Only the correct SMA connector series should be mated with these modules. The 40-785A range uses SMA-3.5, SMA-2.9 & SMA-1.8 connectors for 40, 50 & 65GHz respectively, and the user should only mate the correct type to the module, failure to do so may result in damage to the connector.**

NOTE 2: **It is important that the SMA connector's nut is properly tightened to the correct torque with a 5/16 inch wrench. This should be 3-5 in·lbs (0.3 to 0.6 N·m) for brass, and 7-10 in·lbs (0.8–1.1 N·m) for stainless steel connectors.**

NOTE 3: **For the remote versions, the relays must not be disconnected from the module when it is energised as this can result in failure of the relay drivers.**

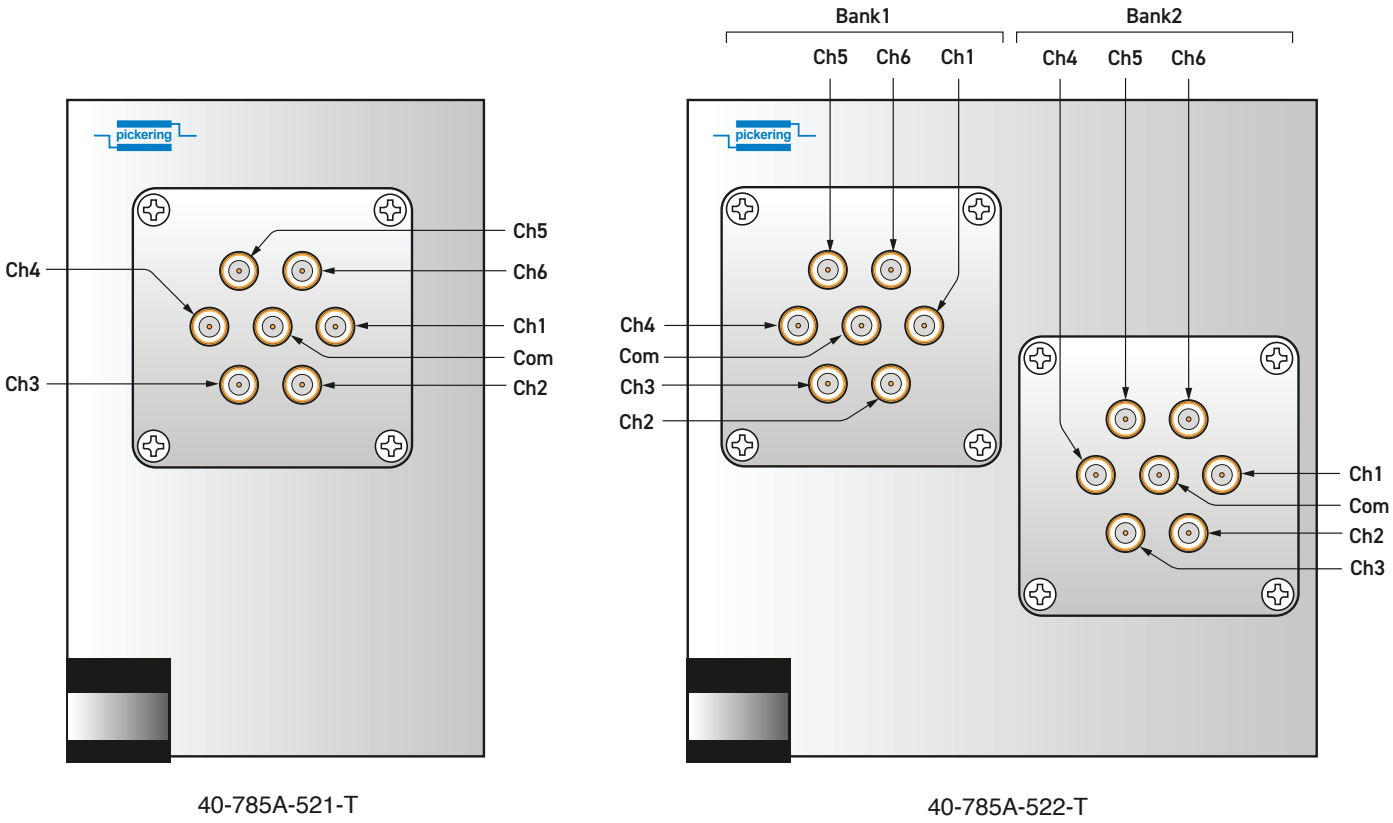


Figure 5.2 - Microwave Multiplexer Module 40-785A: Connector Positions

SECTION 6 - TROUBLE SHOOTING

Refer to the Warnings and Cautions at the front of this manual 

INSTALLATION PROBLEMS

The Plug & Play functionality of Pickering switch cards generally ensures trouble-free installation.

If you do experience any installation problems you should first ensure that all cards are properly seated in their slots. Improperly mated cards may go undetected by the operating system, or may be detected as a card of an unknown type. They can also cause the computer to freeze at various stages in the boot sequence.

If your system employs a remote control interface you should check the integrity of all remote control interface links. When the system is powered up, and during Windows start-up, you should expect to see periodic activity on the remote control interface RX/TX (yellow) indicators, clearing to leave only the PWR/LNK (green) LEDs illuminated. The RX/TX indicators should show activity when you attempt to access a card.

DIAGNOSTIC UTILITY

The Pickering Diagnostic Utility (accessible through the Programs>>Pickering>>PXI Utilities menu) generates a diagnostic report of the system's PCI configuration, highlighting any potential configuration problems. Specific details of all installed Pickering switch cards are included. All the installed Pickering switch cards should be listed in the "Pilpxi information" section - if one or more cards is missing it may be possible to determine the reason by referring to the PCI configuration dump contained in the report, but interpretation of this information is far from straightforward, and the best course is to contact Pickering support: support@pickeringtest.com, if possible including a copy of the diagnostic report.

In the "VISA information" section, if VISA is not installed its absence will be reported. This does not affect operation using the Direct I/O driver, and is not a problem unless you wish to use VISA. VISA is a component of National Instruments LabWindows/CVI and LabVIEW, or is available as a standalone environment.

If VISA is present and is of a sufficiently recent version, the section "Pipx40 information" should present a listing similar to "Pilpxi information".

Please note that the Diagnostic Utility cannot access cards if they are currently opened by some other application, such as the Test Panels or Terminal Monitor.

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SECTION 7 - MAINTENANCE INFORMATION

Refer to the Warnings and Cautions at the front of this manual 

PERIODIC MAINTENANCE

This product and its corresponding chassis do not require any periodic maintenance.

GENERAL CLEANING

- Isolate the electrical power from the chassis and ensure that no user I/O signals are being applied.
- Wipe the product & chassis surfaces with a clean dry anti-static cloth only.

SOFTWARE UPDATE

For PXI modules operating in a PXI chassis, no module software updates are required. For the latest version of the driver please refer to our web site **pickeringtest.com** where links to our Software Download page will provide the latest version of the driver software for the various programming environments encountered.

For PXI modules which are supported in one of Pickering Interfaces' Modular LXI Chassis (such as the 60-102B and 60-103B) no module software update is required. If the module was introduced after the LXI chassis was manufactured the module may not be recognized, in this case the chassis firmware may need upgrading. This is a simple process which is described in the manual for the Modular LXI Chassis.

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