40-480 User Manual

PXI 8/32 Channel Automotive Switch Simulator Module



PXI

Issue 4.2 January 2020

pickeringtest.com

© COPYRIGHT (2020) PICKERING INTERFACES. ALL RIGHTS RESERVED.

No part of this publication may be reproduced, transmitted, transcribed, translated or stored in any form, or by any means without the written permission of Pickering Interfaces.

Technical details contained within this publication are subject to change without notice.

ISO 9001
Reg No. FM38792

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.	

CONTENTS

Copyright Statement II

Technical Support and Warranty III

Product Safety IV

Contents (this page) V

Warnings and Cautions VII

Section 1
Technical Specification 1.1

Section 2
Technical Description 2.1
Functional Description 2.1

Section 3
Installation 3.1
Pre Operation Checks 3.1
Hardware Installation 3.2
Software Installation 3.2
Testing Operation 3.3

Section 4
Programming Guide 4.1
Programming Options For Pickering PXI Modules 4.1
Module Architecture - 40-480 ..... 4.2
Programming The Module 4.3

Section 5
Connector Information 5.1

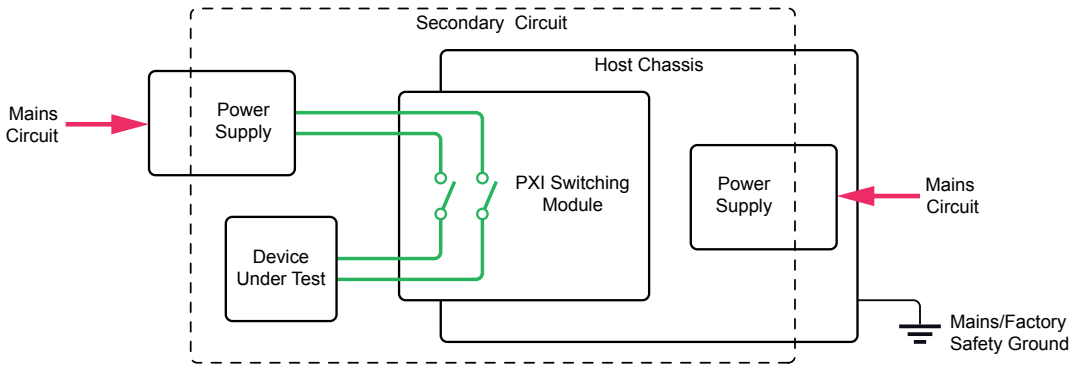
Section 6
Trouble Shooting 6.1

Section 7
Maintenance Information 7.1
Relay Look-Up Tables 7.1

THIS PAGE INTENTIONALLY BLANK

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. Not to be used in safety critical circuits, refer to the Pickering Interfaces' terms & conditions of sale. This module must not be used for the switching of Mains Circuits. For the switching of voltages up to the module's full specification, Secondary Circuit power supplies and the Device Under Test must be fully isolated from the Mains Circuit and the safety earth. The host chassis must be correctly installed and be connected to mains or factory safety ground, please refer to your chassis installation manual.  **Diagram Showing Separation Between The Mains Circuit and Secondary Circuit / DUT** For the purposes of this document, a Mains Circuit is an installation classified as Overvoltage Category II up to 300V. Separation between the Secondary Circuit and Mains Circuit is achieved by a transformer in which the primary windings are separated from the secondary windings by reinforced insulation, double insulation, or a screen connected to the protective conductor terminal.	

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.

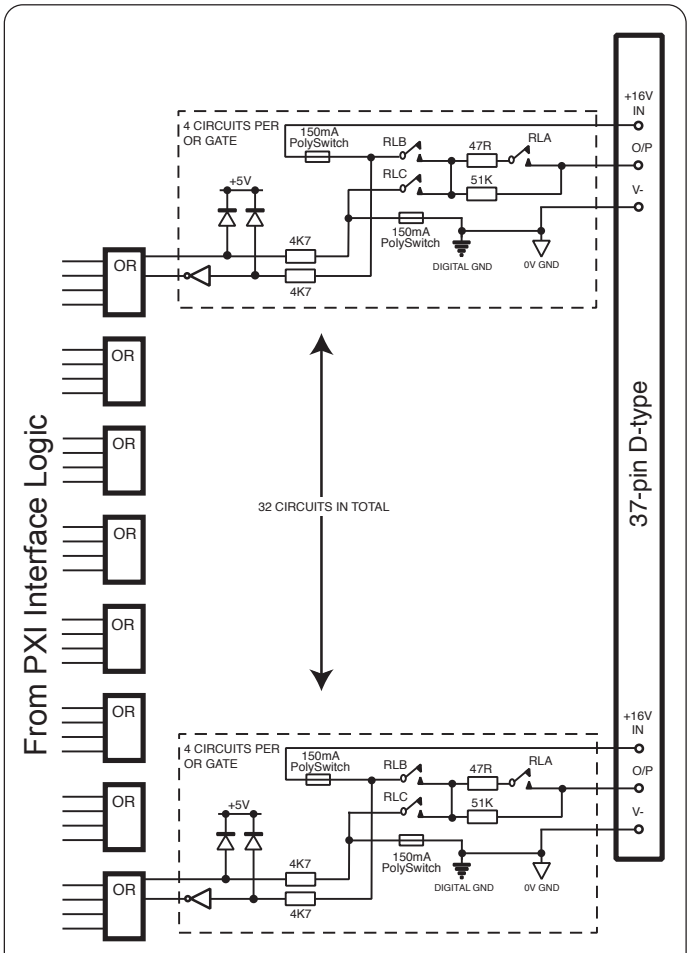
SECTION 1 - TECHNICAL SPECIFICATION

- Simulates 8, 16 or 32 Switches
- Simulates Leaky or Dirty switches
- Protects UUT From Fault Conditions
- Robust Design Protected Against Faults In DUT
- Suitable for 12V and 24V Systems
- Built In Fault Monitoring
- Suitable For Switch Simulation In Transportation Electronics Module Testing
- VISA & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- 3 Year Warranty



The 40-480 is designed to simulate the operation of automotive switches. It can be used to test the capability of automotive controllers to cope with dirty contacts or leaking current caused by switch contamination. It allows automotive I/O devices to be tested for correct operation under adverse conditions. The design includes protection circuits that ensure module damage cannot be caused by wiring faults or UUT failures. The module is available with 8, 16 or 32 channels and is suitable for both 12V and 24V automotive applications.

The module uses high quality instrument grade reed relays to ensure long service life, fast response and repeatable performance.



Functional Block Diagram for the 40-480 8, 16 or 32 Channel Switch Simulator Module

Relay Type

The 40-480 is fitted with ruthenium sputtered reed relays, these offer very long life with good low level switching performance and excellent contact resistance stability. Spare reed relays are built onto the circuit board to allow easy maintenance with minimum downtime.

All reed relays are manufactured by our sister company Pickering Electronics: pickeringrelay.com

Specification

Input Voltage Range:	8V-24VDC*
Power Rating:	0.25W per channel
PolySwitch Rating:	150mA threshold current, 50mA hold current (each bank).
Switch Simulation (typical):	47Ω, 51kΩ or open circuit to ground or input voltage.
Off State Resistance:	$>10^9\Omega$
Operate Time:	<0.5ms
Release Time:	<0.5ms
Expected Life (operations)	
Low power load:	$>1x10^8$

* For full voltage rating, signal sources must be fully isolated from mains supply and safety earth.

Power Requirements

+3.3V	+5V	+12V	-12V
0	750mA (typ 400mA)	0	0

Module Operation

The module has a common input voltage connection for all channels. Each output can be set to as open circuit by opening all the relays. With RLC closed (see diagram overleaf) the output can simulate a switch with a leakage resistance of 51kΩ to the supply voltage, simulating a condition caused by oil or dirt contamination across the terminals or contacts of an automotive switch.

With the output set to simulate a switch closure, channels can be set to have a resistance of 47Ω by closing RLA and RLB. This simulates a switch with a high contact resistance caused by contamination. The module can be configured to simulate switches operating to ground or to the common input voltage.

The 40-480 includes protection systems that ensure neither the device under test or the module can be easily damaged by programming errors, faulty wiring connections or faults in the device under test. Each channel includes PolySwitches to prevent the drawing of large currents that could damage the system. The condition of the PolySwitches can be monitored via the PXI interface, and if one becomes open circuit it can be reset by opening all the relays contacts, curing the the fault, then resetting the module.

Mechanical Characteristics

Single slot 3U PXI (CompactPCI card).
Module weight: 240g (40-480-221).
3D models for all versions in a variety of popular file formats are available on request.

Connectors

PXI bus via 32-bit P1/J1 backplane connector.
Signals via front panel 37-pin male D-type connector, for pin outs please refer to the operating manual.

Operating/Storage Conditions

Operating Conditions

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

Storage and Transport Conditions

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

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 33MHz 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.

Product Order Codes

8 Channel Switch Simulation Module	40-480-021
16 Channel Switch Simulation Module	40-480-121
32 Channel Switch Simulation Module	40-480-221

Product Customization

Pickering PXI 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.

Support Products

Spare Relay Kits

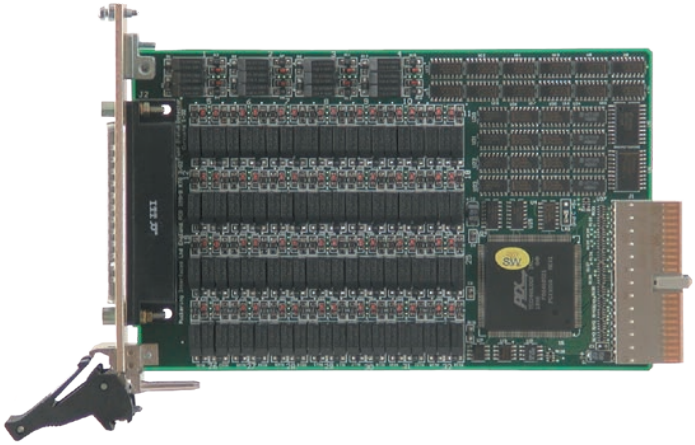
Kits of replacement relays are available for the majority of Pickering's PXI switching products, simplifying servicing and reducing down-time.

Product	Relay Kit
40-480-021/121/221	91-100-015

For further assistance, please contact your local Pickering sales office.

Mating Connectors & Cabling

For connection accessories for the 40-480 please refer to the 90-007D 37-pin D-type Connector Accessories data sheet where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.



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

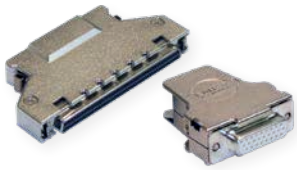
Pickering LXI or LXI/USB Modular Chassis—only accept our 1000+ PXI Switching & Simulation Modules:

- 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

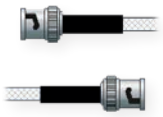
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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



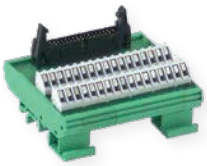
Connectors & Backshells



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 sister company, Pickering Electronics. 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

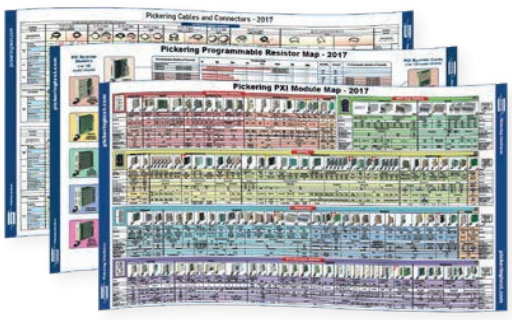
Three Year Warranty & Guaranteed Long-Term Support

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, as well as complete product catalogs and product reference maps to assist when looking for the switching, simulation and cable and connector 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

THIS PAGE INTENTIONALLY BLANK

SECTION 2 - TECHNICAL DESCRIPTION

FUNCTIONAL DESCRIPTION

A functional block diagram is provided in Figure 2.1. The Module accepts a +5V supply from the PXI backplane via Compact PCI connector J1. The interface to the device under test is via the front panel mounted 37-pin D-type connector, J2. Depending on the module version up to eight, or up to 32 devices may be connected to the module. The module comprises a PCB populated with reed relays, resettable fuses and control logic.

The following description applies for eight or thirty two output circuits:

If the module is connected to the device under test via RLB, V+ (16V) is connected via the 37-pin D-type connector. If the module is connected to the device under test via RLC, V- (0V) is connected via the 37-pin D-type connector. This enables the input from the device under test to be set high or low. Relay contact RLA determines which resistance path is used, i.e. 47Ω or 51kΩ. Resettable fuses (PolySwitches) are provided in order to protect the module against short circuits which may be present in the device under test. A Fuse Status Detector Circuit, comprising an OR gate and associated components, monitors the status of the protection fuses. In the event that a fuse blows the status of the input to the fuse detector circuit changes and is reported to the PCI backplane, indicating that there is a problem with the device under test. The fuses are reset by opening all inputs to the module.

The module configuration is determined by data stored in EEPROM U7. Relay Drivers U18 to U19 are addressed by PCI bridge U1 to output the required signal in order to open or close specific relay contacts. PCI Bridge U1 is configured by EEPROM U2.

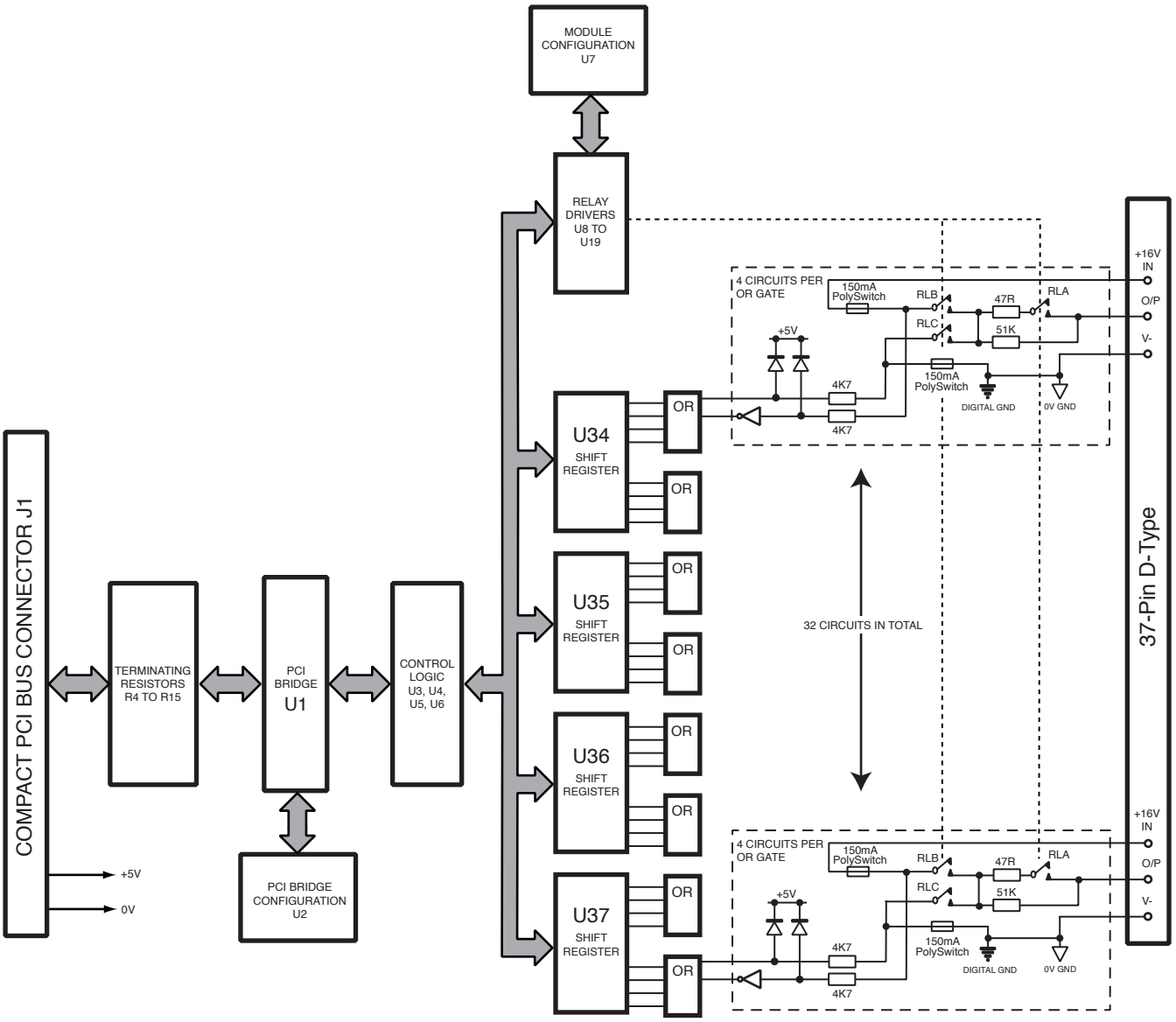


Figure 2.1 - 8/32 Channel Switch Simulator Module 40-480: Functional Block Diagram

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.

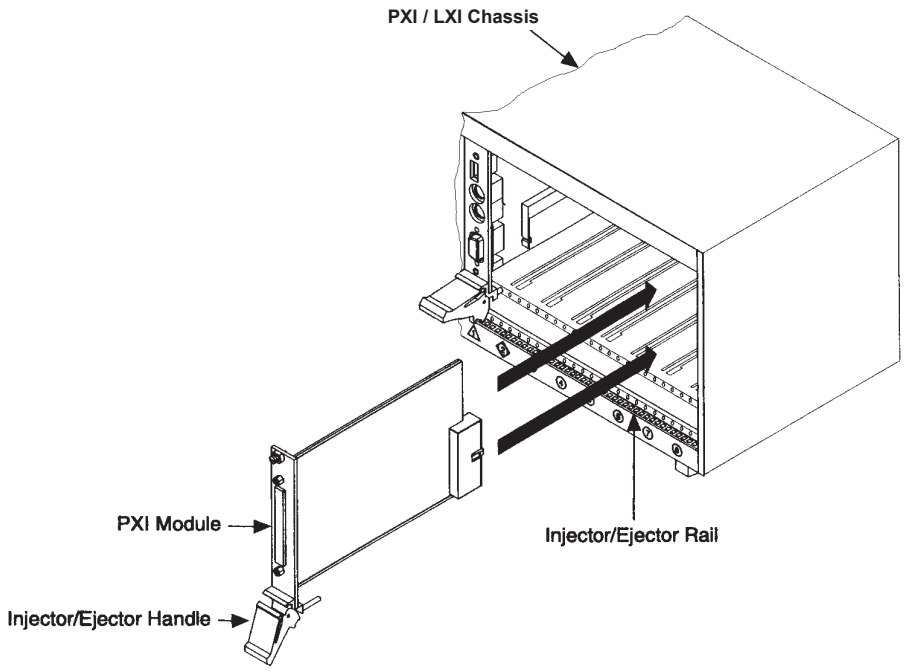


Figure 3.1 - Installing the Module into a PXI/cPCI/LXI Chassis

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.

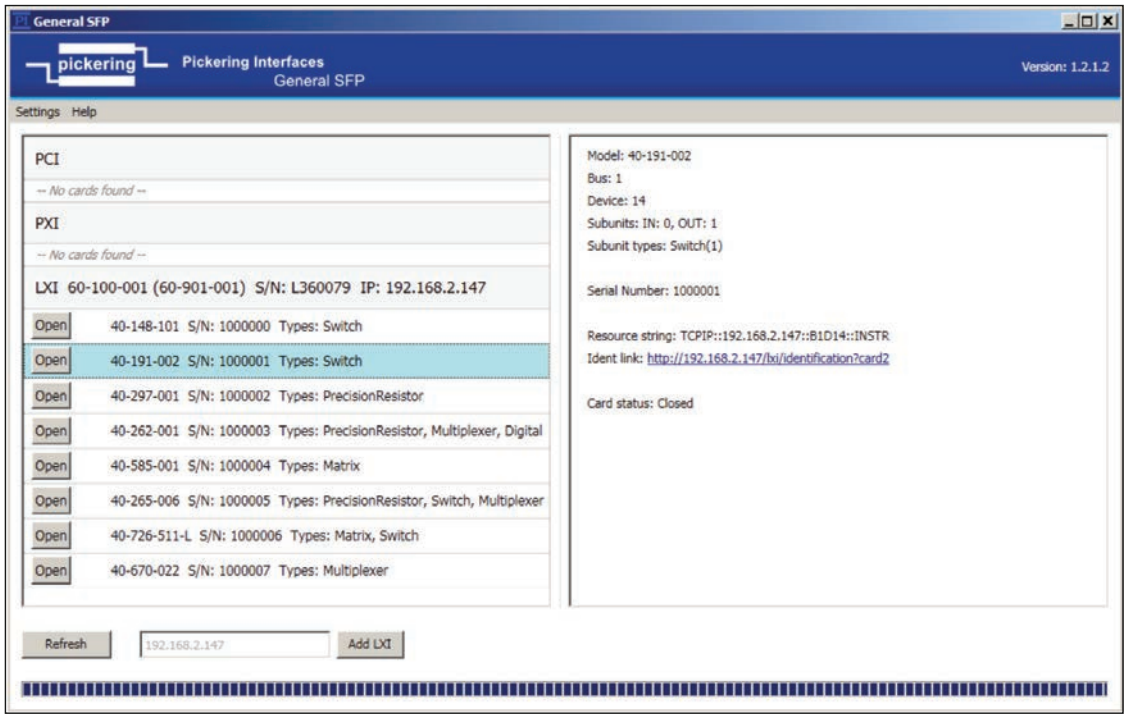


Figure 3.3 - General Soft Front Panel Selector

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

THIS PAGE INTENTIONALLY BLANK

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 - 40-480

The card presents a number of identical channels of simulated switches.

40-480-021: 8 channels

40-480-121: 16 channels

40-480-221: 32 channels

The schematic diagram of a single channel is shown in Figure 4.1 below:

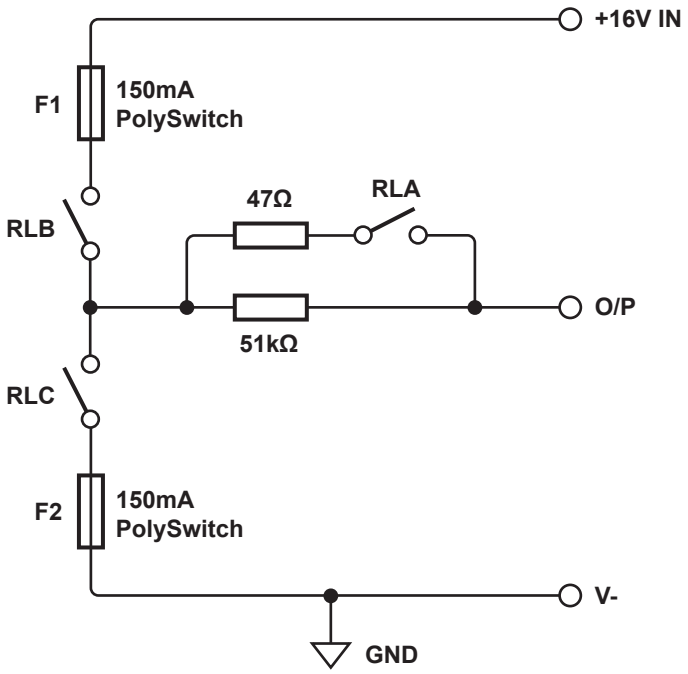


Figure 4.1 - Schematic Diagram of One Channel of the 40-480 Switch Simulator

With all relays un-energized the output is disconnected.

Closing RLB creates a path from 'O/P' to '+16V IN' which comprises PolySwitch F1 and a series resistor of 51kΩ. This simulates a poorly isolated switch to the positive supply line.

Closing RLC creates a path from 'O/P' to 'V-' comprising PolySwitch F2 and the 51kΩ resistor. This simulates a poorly isolated switch to the negative supply line.

Operating RLA bypasses the 51kΩ resistor with a 47Ω resistor, which simulates a switch with poor contact resistance.

NOTE: While the card does not prevent this, the user should NOT operate both RLB and RLC simultaneously since this will connect the positive supply to the negative supply via the 2 fuse. The card will not be damaged by this situation since one of the fuses will operate, but it is no practical use.

The two fuses are monitored by internal logic. If F1 or F2 is open circuit, then a logic 1 is placed on the monitor port.

Programming the Module

The card presents itself as 2 sub-units, one input sub-unit and one output sub-unit.

Input Sub-Unit

The input sub-unit is of a size equal to the number of channels, so 32 bits wide on the 40-480-221, one bit per channel. If either PolySwitch is open circuit a logic 1 will appear on the bit representing the affected channel.

Output Sub-Unit

The output sub-unit comprises 3 bits per channel, so 96 bits wide on the 40-480-221. For each channel control over RLA, RLB and RLC is achieved by setting the appropriate bit.

Table 4.1 - Bit/Relay Cross-Reference: 40-480-221

Bit Number	Relay Controlled
1	Channel 1 RLA
2	Channel 1 RLB
3	Channel 1 RLC
4	Channel 2 RLA
5	Channel 2 RLB
6	Channel 2 RLC
⋮	⋮
94	Channel 32 RLA
95	Channel 32 RLB
96	Channel 32 RLC

NOTE: 40-480-021 & 40-480-121 are operated in the same way but have a maximum of 24 an 48 bits respectively.

Control via the Software Drivers

Using PILPXI non-VISA driver:

Output Sub-Unit

`PIL_OpBit`	control an individual bit in the output sub-unit.
`PIL_WriteSub`	simultaneously control all bits in the output sub-unit.
`PIL_ViewBit`	monitor the current state of a single output in the output sub-unit
`PIL_ViewSub`	monitor the current states of all the outputs in the output sub-unit

Input Sub-Unit

`PIL_ReadBit`	read the logic state of a single bit in the input sub-unit
`PIL_ReadSub`	read the logic states of all the bits in the input sub-unit

Using PIPX40 VISA driver:

Output Sub-Unit

`PIPX40_setChannelState`	control an individual bit in the output sub-unit.
`PIPX40_setChannelPattern`	simultaneously control all bits in the output sub-unit.
`PIPX40_getChannelState`	get the state of a single output bit
`PIPX40_getChannelPattern`	get the states of all output bits

Input Sub-Unit

`PIPX40_readChannelState`	read the logic state of a single bit in the input sub-unit
`PIPX40_readChannelPattern`	read the logic states of all the bits in the input sub-unit

Using pi40iv IVI driver:

Class Compliant Operation

This card is provided in the pi40iv driver definition file and so is usable from the IVI driver.

```
ViStatus pi40iv_Connect (ViSession vi, ViConstString channel1,ViConstString
channel2);
```

```
ViStatus pi40iv_Disconnect (ViSession vi, ViConstString channel1, ViConstString
channel2);
```

```
ViStatus pi40iv_DisconnectAll (ViSession vi);
```

These functions may be used to control ONLY the output sub-unit. The driver will assign channel names:

‘com1/ch1’, ‘com2/ch2’ etc. through to ‘com96/ch96’ in the case of the 32 channel card.

However the IVI-Swtch specification provides no means to read back the input states.

Table 4.2 - IVI Channel Names

Model Number	Channel	RLA	RLB	RLC
40-480-021, 40-480-121 & 40-480-221	1	com1 -> ch1	com2 -> ch2	com3 -> ch3
	2	com4 -> ch4	com5 -> ch5	com6 -> ch6
	3	com7 -> ch7	com8 -> ch8	com9 -> ch9
	4	com10 -> ch10	com11 -> ch11	com12 -> ch12
	5	com13 -> ch13	com14 -> ch14	com15 -> ch15
	6	com16 -> ch16	com17 -> ch17	com18 -> ch18
	7	com19 -> ch19	com20 -> ch20	com21 -> ch21
	8	com22 -> ch22	com23 -> ch23	com24 -> ch24
40-480-121 & 40-480-221	9	com25 -> ch25	com26 -> ch26	com27 -> ch27
	10	com28 -> ch28	com29 -> ch29	com30 -> ch30
	11	com31 -> ch31	com32 -> ch32	com33 -> ch33
	12	com34 -> ch34	com35 -> ch35	com36 -> ch36
	13	com37 -> ch37	com38 -> ch38	com39 -> ch39
	14	com40 -> ch40	com41 -> ch41	com42 -> ch42
	15	com43 -> ch43	com44 -> ch44	com45 -> ch45
	16	com46 -> ch46	com47 -> ch47	com48 -> ch48
40-480-221 only	17	com49 -> ch49	com50 -> ch50	com51 -> ch51
	18	com52 -> ch52	com53 -> ch53	com54 -> ch54
	19	com55 -> ch55	com56 -> ch56	com57 -> ch57
	20	com58 -> ch58	com59 -> ch59	com60 -> ch60
	21	com61 -> ch61	com62 -> ch62	com63 -> ch63
	22	com64 -> ch64	com65 -> ch65	com66 -> ch66
	23	com67 -> ch67	com68 -> ch68	com69 -> ch69
	24	com70 -> ch70	com71 -> ch71	com72 -> ch72
	25	com73 -> ch73	com74 -> ch74	com75 -> ch75
	26	com76 -> ch76	com77 -> ch77	com78 -> ch78
	27	com79 -> ch79	com80 -> ch80	com81 -> ch81
	28	com82 -> ch82	com83 -> ch83	com84 -> ch84
	29	com85 -> ch85	com86 -> ch86	com87 -> ch87
	30	com88 -> ch88	com89 -> ch89	com90 -> ch90
	31	com91 -> ch91	com92 -> ch92	com93 -> ch93
	32	com94 -> ch94	com95 -> ch95	com96 -> ch96

Custom Driver Operation

The pi40iv driver includes some non-class compliant functions that permit full control of the output sub-unit and also a means to read the input sub-unit to be read.

These functions are in the main exact parallels of the PILPXI driver calls, but with the addition of some functions to more easily ascertain the size of each sub-unit.

Output Sub-Unit

```
ViStatus pi40iv_GetNumberOutputSubs(ViSession vi, ViUInt32 *OutSubs);

ViStatus pi40iv_GetOutputSizeBits(ViSession vi, ViUInt32 OutSub, ViUInt32 *Size);

ViStatus pi40iv_GetOutputSizeDwords(ViSession vi, ViUInt32 OutSub, ViUInt32 *Size);

ViStatus pi40iv_SetOutputBit(ViSession vi, ViUInt32 OutSub, ViUInt32 BitNum,
ViUInt32 State);

ViStatus pi40iv_SetOutputSub(ViSession vi, ViUInt32 OutSub, ViUInt32 *Data);

ViStatus pi40iv_GetOutputBit(ViSession vi, ViUInt32 OutSub, ViUInt32 BitNum,
ViUInt32 *State);

ViStatus pi40iv_GetOutputSub(ViSession vi, ViUInt32 OutSub, ViUInt32 *Data);
```

Input Sub-Unit

```
ViStatus pi40iv_GetNumberInputSubs(ViSession vi, ViUInt32 *InSubs);

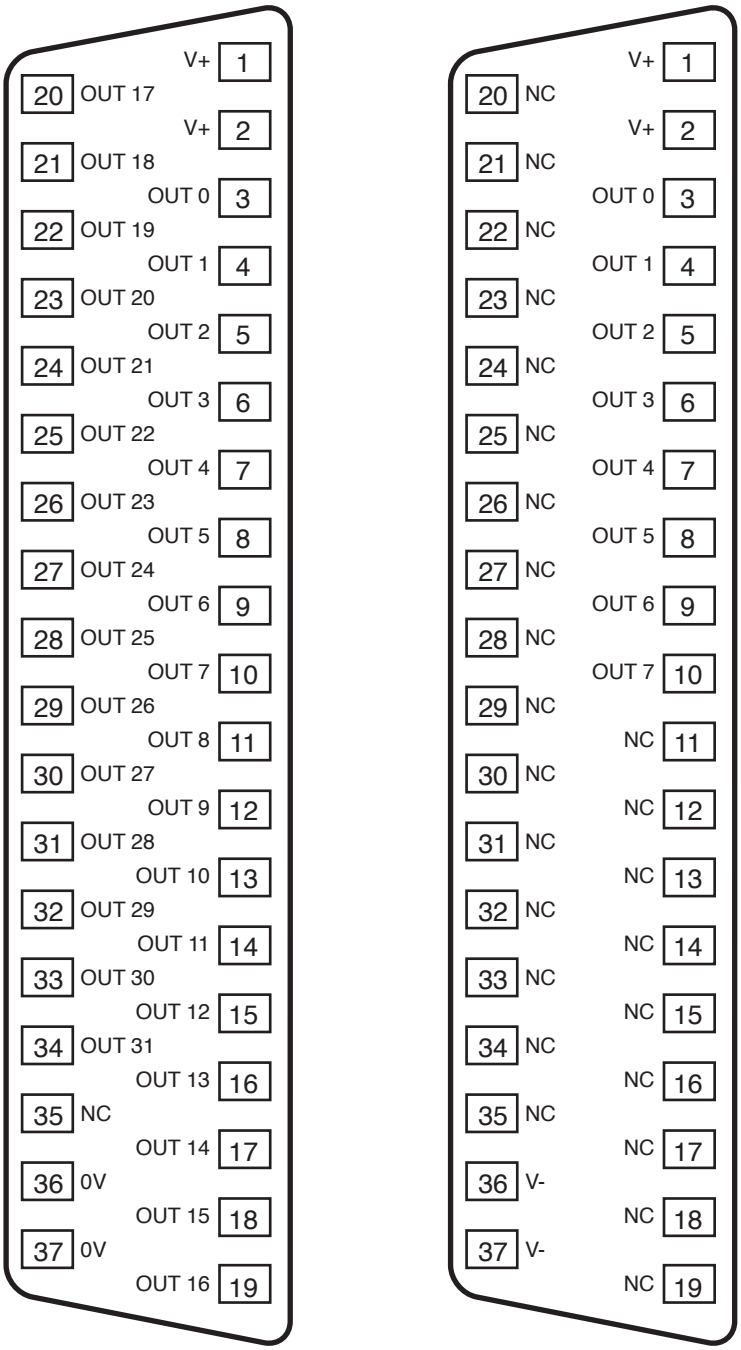
ViStatus pi40iv_GetInputSizeBits(ViSession vi, ViUInt32 InSub, ViUInt32 *Size);

ViStatus pi40iv_GetInputSizeDwords(ViSession vi, ViUInt32 InSub, ViUInt32 *Size);

ViStatus pi40iv_GetInputBit(ViSession vi, ViUInt32 InSub, ViUInt32 BitNum, ViUInt32
*State);

ViStatus pi40iv_GetInputSub(ViSession vi, ViUInt32 InSub, ViUInt32 *Data);
```

SECTION 5 - CONNECTOR INFORMATION



40-480-221 40-480-021

Figure 5.1 - 8/32 Channel Switch Simulator Module 40-480: Front Panel Connector (37-pin male D-type connector viewed from front of module)

THIS PAGE INTENTIONALLY BLANK

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.

THIS PAGE INTENTIONALLY BLANK

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.

RELAY LOOK-UP TABLES

The following pages provide a cross reference between the signal paths of the Relay Module and the physical relays on the PCB. The tables can be used in the fault finding process and should be used in conjunction with the corresponding PCB layout diagrams to identify the position of faulty relays.

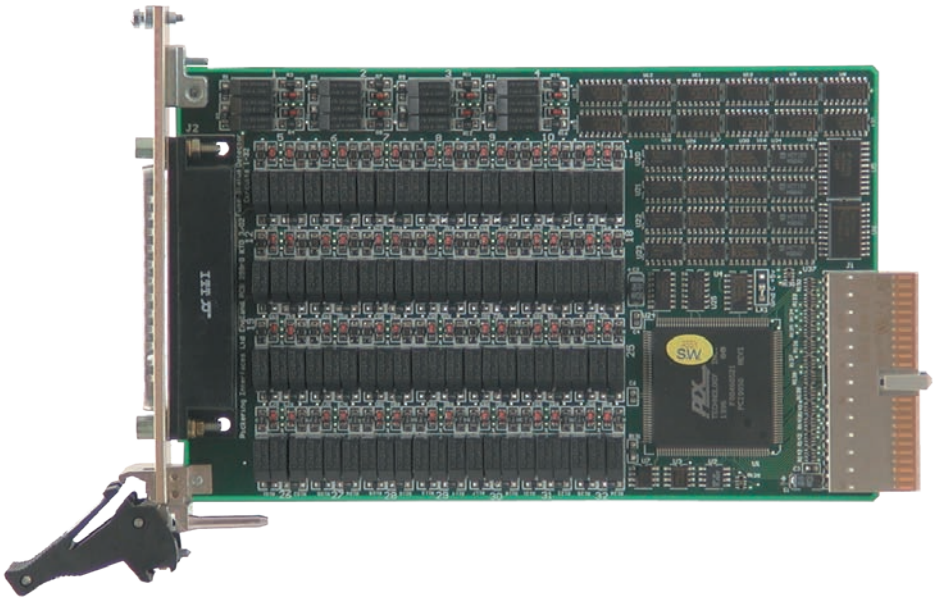


Figure 7.1 - 40-480-221 Automotive Switch Simulator Module

TABLE 7.1 - Automotive Switch Simulator Module 40-480: Relay Numbering

Channel Number	Relay Function	Relay Number
1	RLA	RL1
	RLB	RL2
	RLC	RL3
2	RLA	RL4
	RLB	RL5
	RLC	RL6
3	RLA	RL7
	RLB	RL8
	RLC	RL9
4	RLA	RL10
	RLB	RL11
	RLC	RL12
5	RLA	RL13
	RLB	RL14
	RLC	RL15
6	RLA	RL16
	RLB	RL17
	RLC	RL18
7	RLA	RL19
	RLB	RL20
	RLC	RL21
8	RLA	RL22
	RLB	RL23
	RLC	RL24
9	RLA	RL25
	RLB	RL26
	RLC	RL27
10	RLA	RL28
	RLB	RL29
	RLC	RL30
11	RLA	RL31
	RLB	RL32
	RLC	RL33
12	RLA	RL34
	RLB	RL35
	RLC	RL36
13	RLA	RL37
	RLB	RL38
	RLC	RL39
14	RLA	RL40
	RLB	RL41
	RLC	RL42
15	RLA	RL43
	RLB	RL44
	RLC	RL45
16	RLA	RL46
	RLB	RL47
	RLC	RL48
17	RLA	RL49
	RLB	RL50
	RLC	RL51
18	RLA	RL52
	RLB	RL53
	RLC	RL54
19	RLA	RL55
	RLB	RL56
	RLC	RL57
20	RLA	RL58
	RLB	RL59
	RLC	RL60
21	RLA	RL61
	RLB	RL62
	RLC	RL63
22	RLA	RL64
	RLB	RL65
	RLC	RL66
23	RLA	RL67
	RLB	RL68
	RLC	RL69
24	RLA	RL70
	RLB	RL71
	RLC	RL72
25	RLA	RL73
	RLB	RL74
	RLC	RL75
26	RLA	RL76
	RLB	RL77
	RLC	RL78
27	RLA	RL79
	RLB	RL80
	RLC	RL81
28	RLA	RL82
	RLB	RL83
	RLC	RL84
29	RLA	RL85
	RLB	RL86
	RLC	RL87
30	RLA	RL88
	RLB	RL89
	RLC	RL90
31	RLA	RL91
	RLB	RL92
	RLC	RL93
32	RLA	RL94
	RLB	RL95
	RLC	RL96

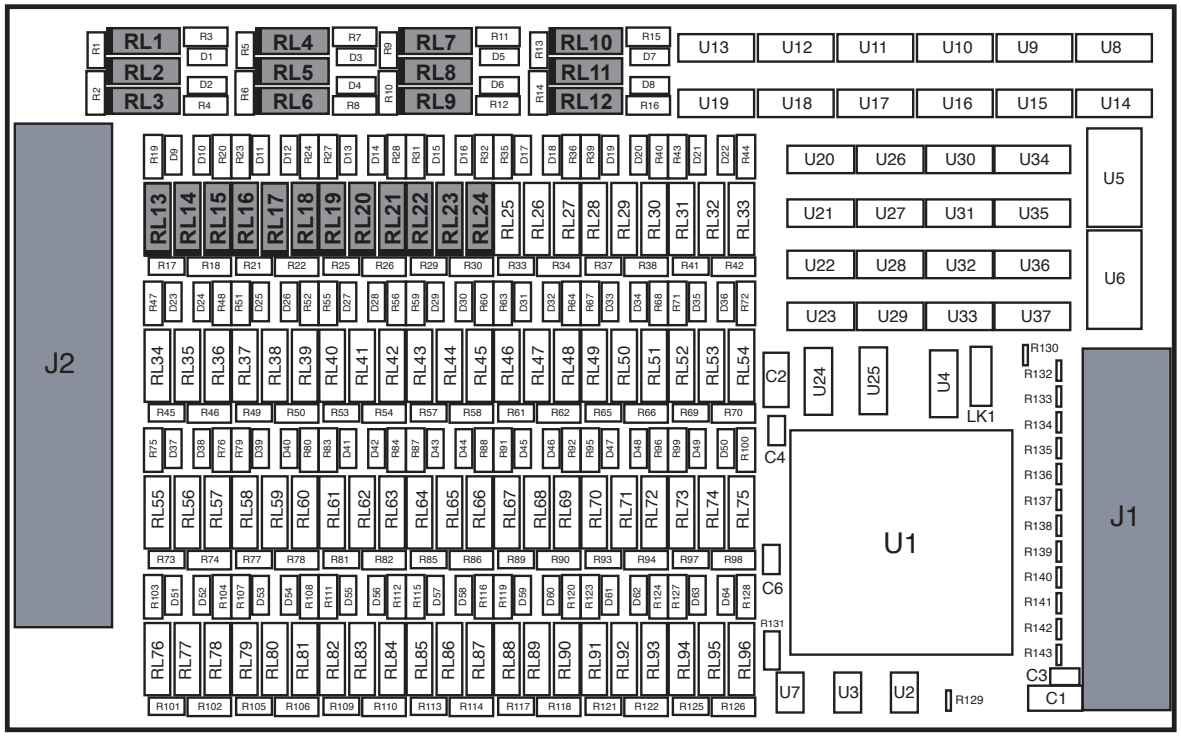


Figure 7.2 - Automotive Switch Simulator Module 40-480-021: Component Layout

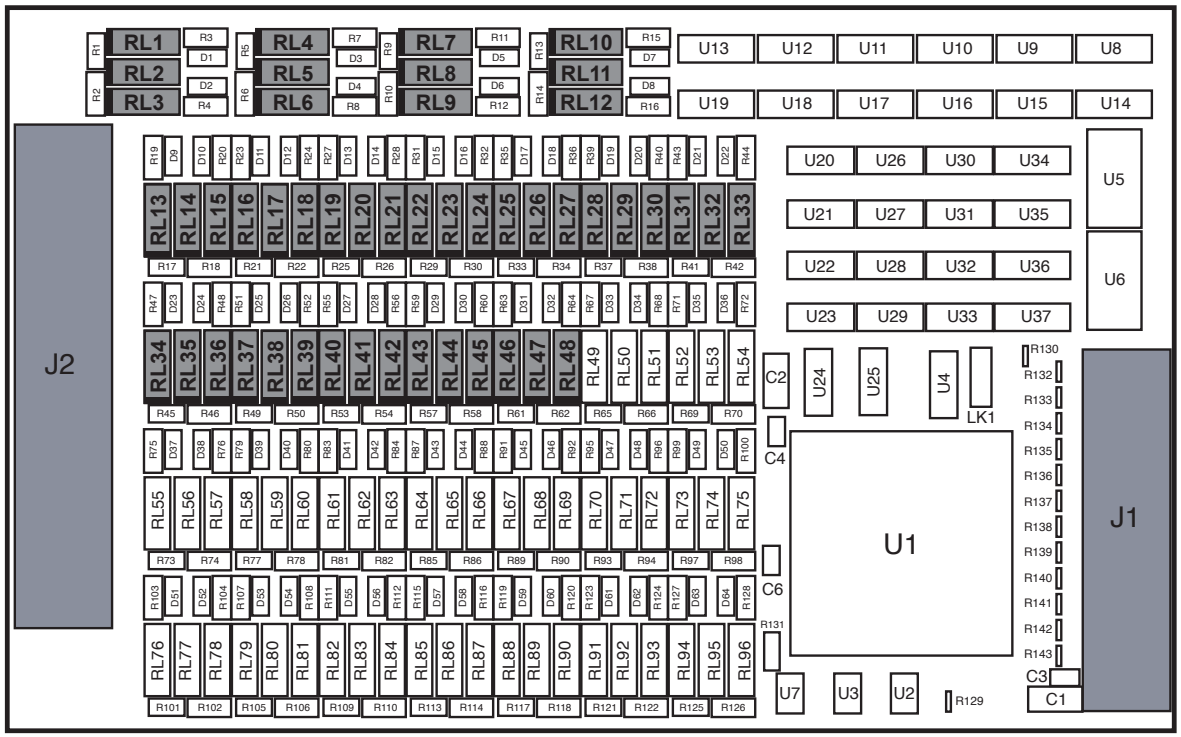


Figure 7.3 - Automotive Switch Simulator Module 40-480-121: Component Layout

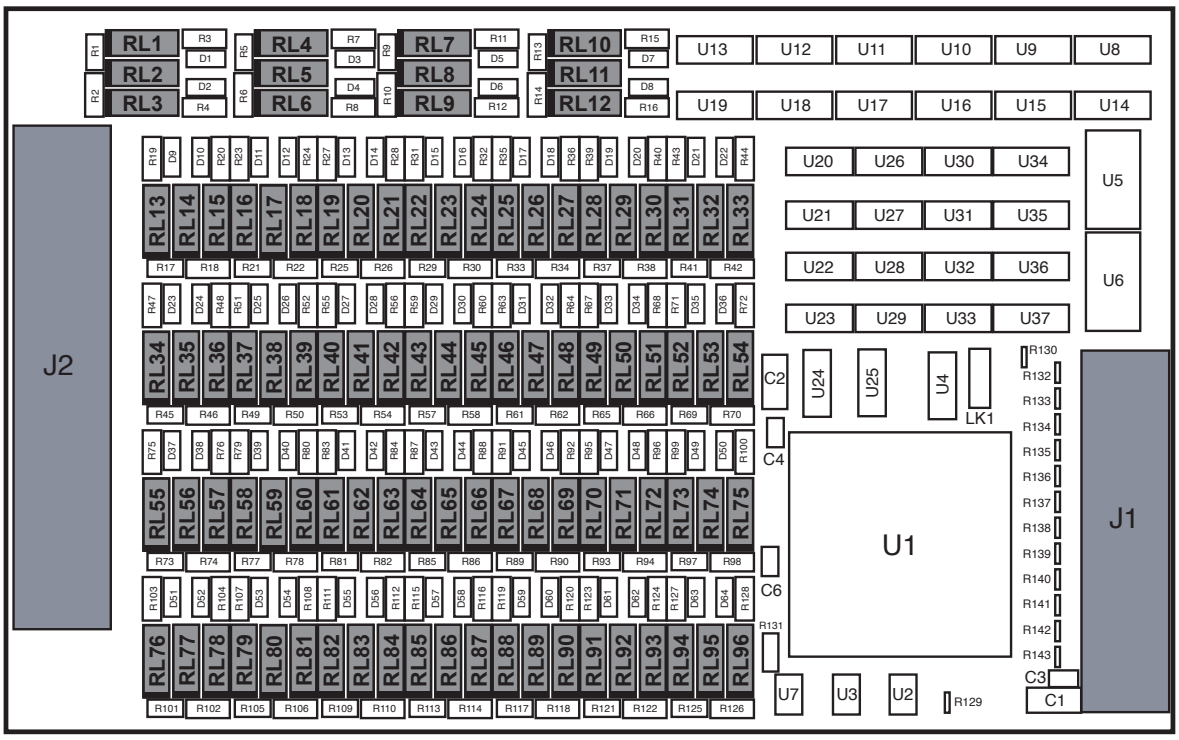


Figure 7.3 - Automotive Switch Simulator Module 40-480-221: Component Layout

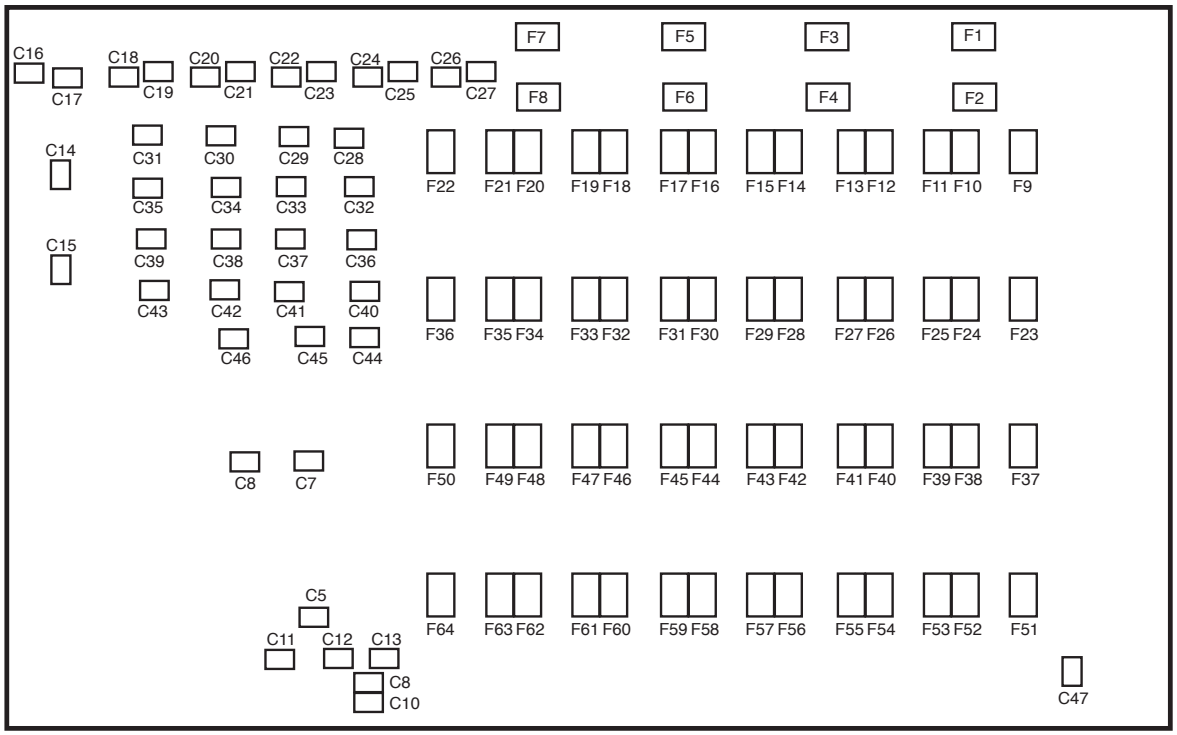


Figure 7.4 - Automotive Switch Simulator Module 40-480: Polyswitch Fuses