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TECHNOLOGY GROUP

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so your equipment works exactly as you specify.

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User Manual

PXI

Power Relay Module
(Model No. 40-160)



Issue 3.5 February 2018

pickeringtest.com

pickering

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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

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PRODUCT SAFETY

LA SÉCURITÉ DES PRODUITS

SAFETY SYMBOLS

SYMBOLES DE SÉCURITÉ

The following safety symbols may be used on the product and throughout the product documentation.	Les symboles de sécurité suivants peuvent être utilisés sur le produit et dans l'ensemble de la documentation produit.

MEANING / DESCRIPTION	SYMBOL	SIGNIFICATION / DESCRIPTION
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.		MISE À LA TERRE Pour identifier les bornes destinées à être raccordées à un conducteur externe de protection contre les chocs électriques en cas de défaut d'isolement, ou pour marquer la borne de mise à la terre.
DANGEROUS VOLTAGE To indicate hazards arising from dangerous voltages.		TENSION DANGEREUSE Pour indiquer les dangers découlant des tensions dangereuses.
WARNING / CAUTION An appropriate safety instruction should be followed or caution to a potential hazard exists. Refer to the relevent instructions detailed within the product manual.		AVERTISSEMENT - ATTENTION Des consignes de sécurité appropriées doivent être suivies. En cas de danger potentiel existant, prendre des précautions. Consulter les instructions détaillées dans le manuel du produit.
HEAVY If this product is heavy reference should be made to the safety instructions for provisions of lifting and moving.		CHARGE LOURDE Si ce produit est lourd il convient de se référer aux consignes de sécurité pour les dispositions de levage et de déplacement.
STATIC SENSITIVE To indicate that static sensitive devices are present and handling precautions should be followed.		SENSIBILITÉ STATIQUE Pour indiquer que des appareils sensibles statiques sont présents et les précautions de manipulation doivent être suivies.

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WARNINGS AND CAUTIONS

AVERTISSEMENTS ET PRÉCAUTIONS

WARNING HAZARDOUS ENVIRONMENTS	SYMBOL	AVERTISSEMENT ENVIRONNEMENTS DANGEREUX
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.		Ce produit n'est spécifiquement pas conçu pour un usage dans des environnements dangereux, par exemple en atmosphères explosives. Si le produit doit être utilisé dans des environnements dangereux, nous recommandons à l'utilisateur de s'assurer que des mesures de protection appropriées soient prises.

WARNING DANGER OF ELECTRIC SHOCK	SYMBOL	AVERTISSEMENT DANGER DE CHOC ELECTRIQUE
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 PXI/LXI 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.		Ce module peut contenir des tensions dangereuses. Avant de retirer le module de la baie, enlever toutes les fournitures et déconnecter les signaux d'E/S utilisateur. Les slots non utilisés dans le châssis PXI/LXI sont peuplées d'obturateurs pour empêcher l'accès aux signaux d'E/S utilisateur qui peuvent être présents. Les obturateurs sont disponibles sur commande chez Pickering dans une variété de largeur de fente. Si le produit est utilisé sans obturateur, par exemple en utilisant une carte d'extension, alors des précautions supplémentaires doivent être prises pour éviter tout contact avec les signaux exposés. Ne pas utiliser dans des circuits critiques de sécurité, se référer à nos Conditions Générales de Ventes. Ce module ne doit pas être utilisé pour la commutation des circuits principaux. Pour la commutation de tensions jusqu'à la spécification complète du module, les alimentations des circuits secondaires et l'appareil sous test doivent être complètement isolés des circuits principaux et de la terre de sécurité. Le châssis hôte doit être correctement installé et connecté à la terre ou au réseau de sécurité d'usine. Veuillez-vous reporter au manuel d'installation de votre châssis.

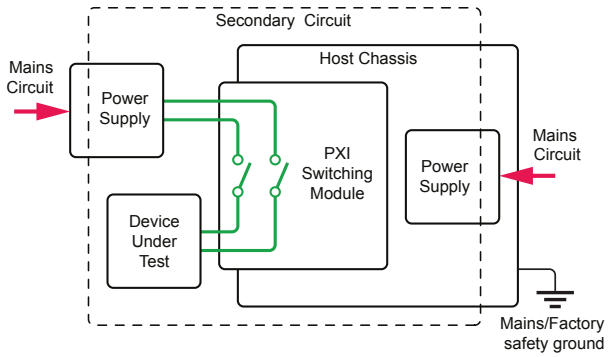


Diagram Showing Separation Between The Mains Circuit and Secondary Circuit / DUT

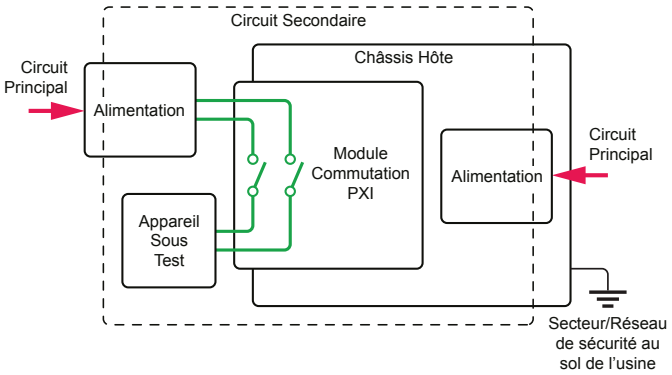


Diagramme Montrant la Séparation Entre le Circuit Principal et le Circuit Secondaire

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.

Aux fins du présent document, un circuit principal est une installation classée dans la Catégorie de Surtension Groupe II jusqu'à 300V. la séparation entre le circuit secondaire et le circuit principal est réalisée par un transformateur dans lequel les enroulements primaires sont séparés des enroulements secondaires par une isolation renforcée, une double isolation ou un blindage relié à la borne de conducteur de protection.

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CAUTION - HANDLING OF ELECTROSTATIC-SENSITIVE SEMICONDUCTOR DEVICES	SYMBOL	ATTENTION - MANIPULATION DES APPAREILS SENSIBLES ELECTROSTATIQUES
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.		Certains appareils semi-conducteurs utilisés dans cet équipement sont susceptibles d'être endommager en raison de la tension statique. Respectez les précautions suivantes lorsque vous manipulez ces appareils dans leur état non terminé, ou sous-ensembles contenant ces appareils : 1. Les personnes démontant partiellement l'équipement à l'aide de ces appareils doivent être mises à la terre par bracelet antistatique et une résistance au point prévu sur l'équipement. 2. Les fers à souder utilisés pendant les opérations de réparation doivent être de type "basse tension" avec des bouts reliés à la terre et isolés à partir de la tension du réseau par un transformateur à double isolation. 3. Les vêtements externes ne doivent pas générer des charges électrostatiques. 4. Les cartes de circuits imprimés (PCB) équipées de ces appareils doivent être entreposées et transportées dans des sacs antistatiques.

CAUTION PRODUCT DOCUMENTATION	SYMBOL	ATTENTION DOCUMENTATION PRODUIT
Suitably qualified & trained users should ensure that the accompanying documentation is fully read and understood before attempting to install or operate the product.		Les utilisateurs qualifiés et formés doivent veiller à ce que la documentation soit entièrement lue et comprise avant l'installation ou l'utilisation du produit.

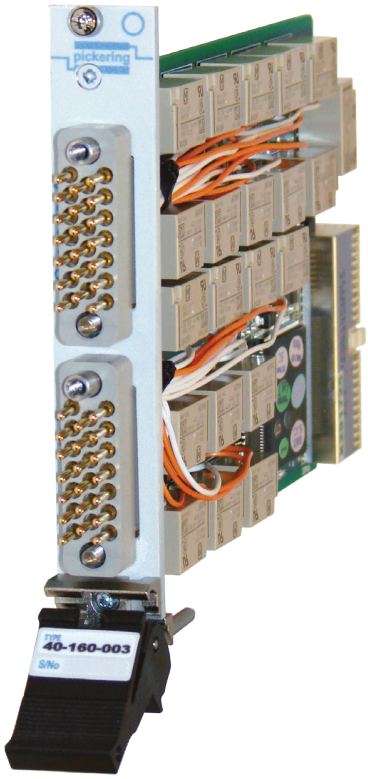
SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS	CONSIGNES DE SÉCURITÉ
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.	Les travaux de nettoyage et de réparation nécessitent que l'équipement soit isolé et déconnecté de la source d'alimentation et des signaux d'E/S utilisateur (voir la section Entretien). • Les procédures de manipulation manuelle appropriées doivent être suivies en fonction du poids du module seul ou le poids combiné des modules et du châssis. • En cas de défaut avec le module ou le châssis, isoler immédiatement et débrancher l'alimentation entrant au châssis et les signaux d'E/S utilisateur. • S'assurer que le matériel est installé, utilisé et entre-tenu par du personnel formé et autorisé. • Pour les produits convenablement équipés, en cas d'urgence, appuyez sur le bouton rouge "arrêt d'urgence" situé sur l'avant de l'unité.

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SECTION 1 - TECHNICAL SPECIFICATION

- 10 x SPST, 20 x SPST & 10 x DPST Options
- Hot Switch up to 125VDC/250VAC
- Cold Switch up to 400VDC/250VAC
- SPST Version: Switch 10A with 300W/2500VA Maximum Power
- DPST Version: Switch 8A with 240W/2000VA Maximum Power
- VISA, IVI & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- 3 Year Warranty



Pickering Interfaces range of power relay modules are suitable for applications requiring switching of either mains voltage or DC current.

The 40-160 module has a choice of SPST relays capable of switching 10A at 250VAC or DPST relays capable of switching 8A at 250VAC. All versions are suitable for inductive/capacitive loads.

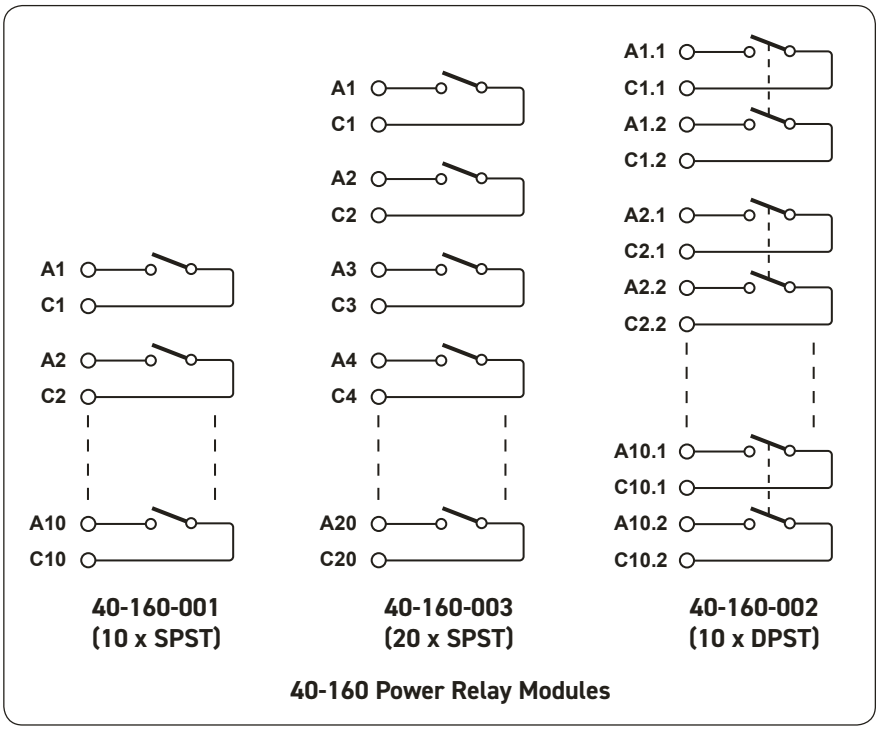
Power relay modules are intended for switching heavy AC or DC loads or for slave switching large external relays, contactors and solenoids.

Range Description:

- 40-160-001 10 x SPST Power Relays.
- 40-160-002 10 x DPST Power Relays.
- 40-160-003 20 x SPST Power Relays.



20-pin Power Connector for 40-160 Power Relay Modules



40-160 Power Relay Modules

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Relay Type

The 40-160 is fitted with electro-mechanical power relays, gold-flash over silver alloy. A **Spare Relay is** built onto the circuit board to facilitate easy maintenance with minimum downtime.

Switching Specification - 40-160-001 & 40-160-003 (SPST)

Contact Type:	Gold flash over silver alloy
Cold Switching Capacity	
Maximum Current:	10A
Maximum Voltage:	400VDC/250VAC
Hot Switching Capacity	
Maximum Current:	10A
Maximum Voltage:	125VDC/250VAC
Maximum Power:*	300W/2500VA
Min. Switching Capacity:	10mA, 5VDC
Maximum Continuous Switch Path Loading:	500A² (Example allowed conditions – 5 Channels at 10A or 20 Channels at 5A, please contact sales office for any further advice)
Max Standoff Voltage:	400VDC
Initial On Path Resistance:	<50mΩ
Off Path Resistance:	$>10^9\Omega$
Bandwidth:	>20MHz
Operate Time:	10ms typical
Expected Life - resistive load †	
Mechanical Life:	$>5x10^7$ operations
At Max. Switch Capacity:	$>1x10^5$ operations

* For variation of maximum hot switching capacity of voltage with current refer to plot.

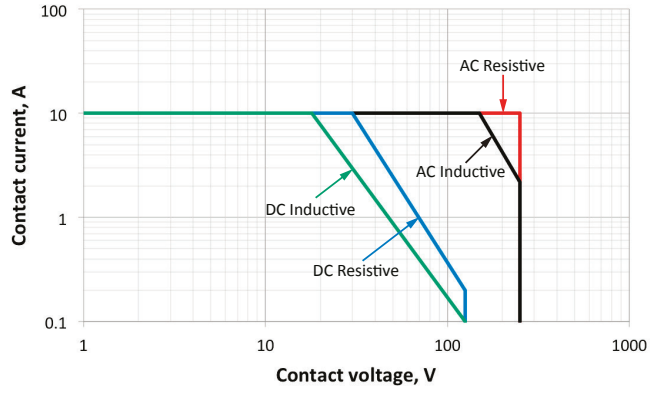
† Note: As switch life deteriorates rapidly when hot switching signals above 30VDC, it is advisable to only cold switch above this level.

Switching Specification - 40-160-002 (DPST)

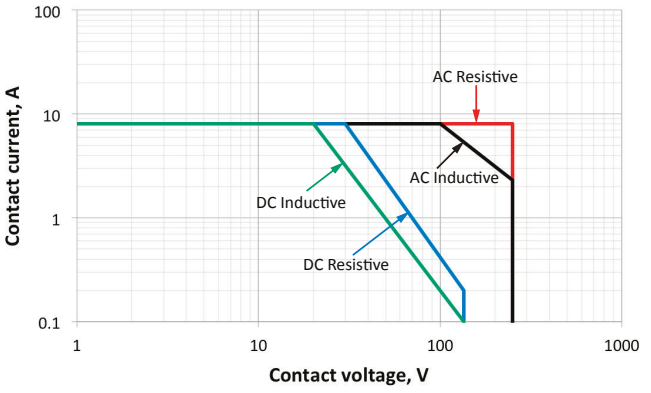
Contact Type:	Gold flash over silver alloy
Cold Switching Capacity	
Maximum Current:	8A
Maximum Voltage:	400VDC/250VAC
Hot Switching Capacity	
Maximum Current:	8A
Maximum Voltage:	125VDC/250VAC
Maximum Power:*	240W/2000VA
Min. Switching Capacity:	10mA, 5VDC
Maximum Continuous Switch Path Loading:	500A² (Example allowed conditions – 5 Channels at 10A or 20 Channels at 5A, please contact sales office for any further advice)
Max Standoff Voltage:	400VDC
Initial On Path Resistance:	<50mΩ
Off Path Resistance:	$>10^9\Omega$
Bandwidth:	>20MHz
Operate Time:	10ms typical
Expected Life - resistive load †	
Mechanical Life:	$>5x10^7$ operations
At Max. Switch Capacity:	$>1x10^5$ operations

* For variation of maximum hot switching capacity of voltage with current refer to plot.

† Note: As switch life deteriorates rapidly when hot switching signals above 30VDC, it is advisable to only cold switch above this level.

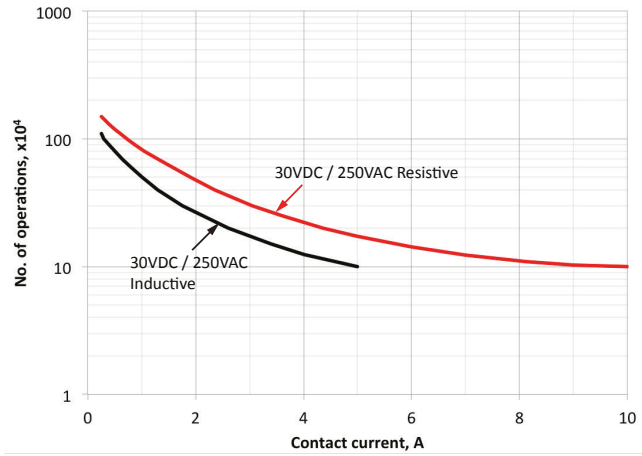


40-160-001/003 (SPST) Current/Voltage Curve

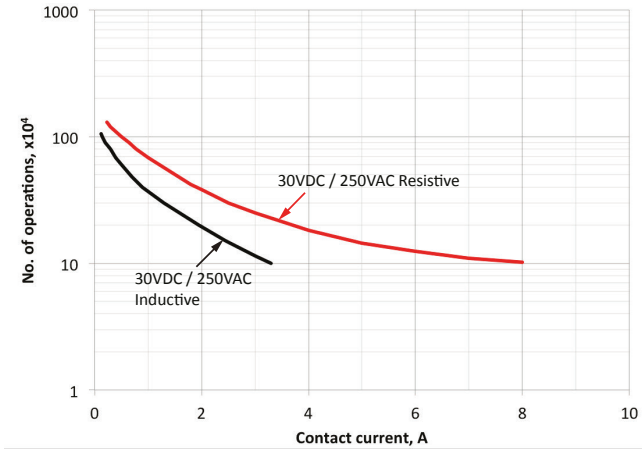


40-160-002 (DPST) Current/Voltage Curve

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40-160-001/003 (SPST) Current/Operating Life Curve



40-160-002 (DPST) Current/Operating Life Curve

Power Requirements

+3.3V	+5V	+12V	-12V
0	0.2A	16.6mA per relay	0

Mechanical Characteristics

Single slot 3U PXI (CompactPCI card).
Module weight: 240g (40-160-001).
280g (40-160-002)
300g (40-160-003)

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 connectors, for pin outs please refer to the operating manual.

- 40-160-001 1 x 20-pin male GMCT connector.
- 40-160-002 2 x 20-pin male GMCT connectors.
- 40-160-003 2 x 20-pin male GMCT connectors.

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 EN61010-1:2001,
EMC Immunity EN61000-6-1:2001, Emissions EN55011:1998.

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Product Order Codes

10 x SPST, 10A Power Relay Module	40-160-001
20 x SPST, 10A Power Relay Module	40-160-003
10 x DPST, 8A Power Relay Module	40-160-002

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

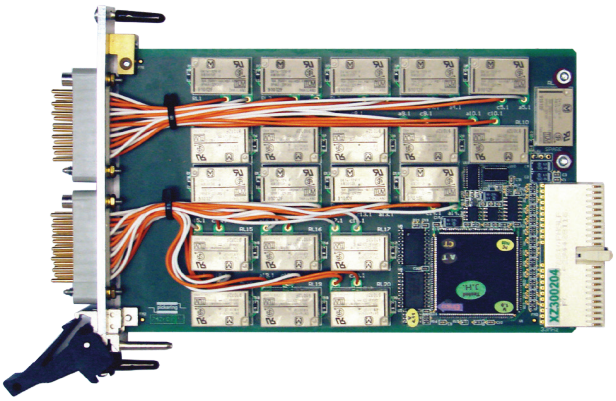
Kits of replacement relays are available for the majority of Pickering's PXI switching products, simplifying servicing and reducing down-time.

Product	Relay Kit
40-160-001	91-100-071
40-160-002	91-100-052
40-160-003	91-100-071

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

Mating Connectors & Cabling

For connection accessories for the 40-160 modules please refer to the 90-014D 20-pin GMCT Connector Accessories data sheets where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.



Side View of 40-160-003
20 x SPST Power Relay Module

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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 insturmentation
- Embedded or remote Windows PC control
- Real-time Operating System Support
- High data bandwidths, especially with PXI Express
- Integrated module timing and synchronization

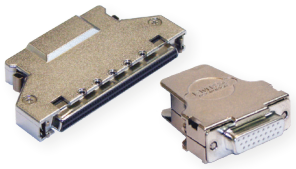
Pickering LXI or LXI/USB Modular Chassis—only accept our 1000+ PXI Switching & Simulation Modules:

- 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 imuunity
- Ethernet provides chassis/controller voltage isolation
- Independence from Windows operating system



Connectivity Solutions

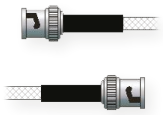
We provide a full range of supporting cable and connector solutions for all our switching products—20 connector families with 1200+ products. We offer everything from simple mating connectors to complex cables assemblies and terminal blocks. All assemblies are manufactured by Pickering and are guaranteed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



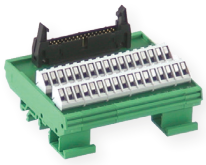
Connectors & Backshells



Multiway Cable Assemblies

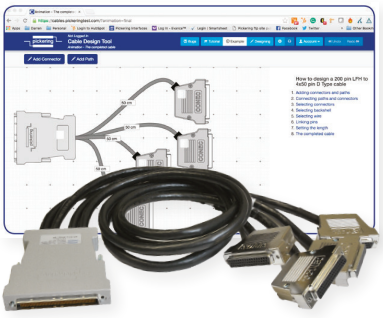


RF Cable Assemblies



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.



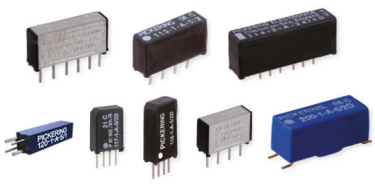
Mass Interconnect

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 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
- **Mathworks** Matlab
- **Marvin** ATEasy
- **MTQ Testsolutions** Tecap Test & Measurement Suite

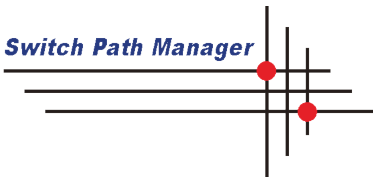
Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries.

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 energises 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

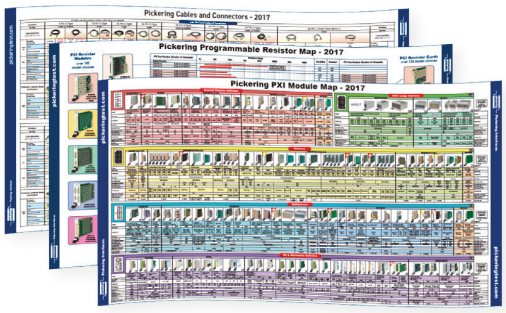
Three Year Warranty

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.

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 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

FUNCTIONAL DESCRIPTION

40-160-001 & 40-160-002

A functional block diagram is provided in Figure 2.1. The Power Relay Modules 40-160-001 and 40-160-002 are powered by +12V and +5V inputs via Compact PCI connector J1. The interface to the user test equipment is via one or two front panel mounted 20-pin GMCT type connectors. The module comprises a PCB which provides mounting for control logic and ten 12V relays RL1 to RL10. Relays RL2 to RL5 and RL7 to RL10 are energised via control signals from relay driver U13. Relays RL2 and RL6 are energised via control signals from relay driver U12. Relay drivers U12 and U13 are interfaced to the low power digital control logic via sink drivers U9 and U10 respectively. The relay drivers are addressed by PCI bridge U1 to output the required signal. PCI Bridge U1 is configured by EEPROM U2. At start up the application of the +12V supply to the relays is delayed by a protection circuit comprising transistors Q1 and Q2.

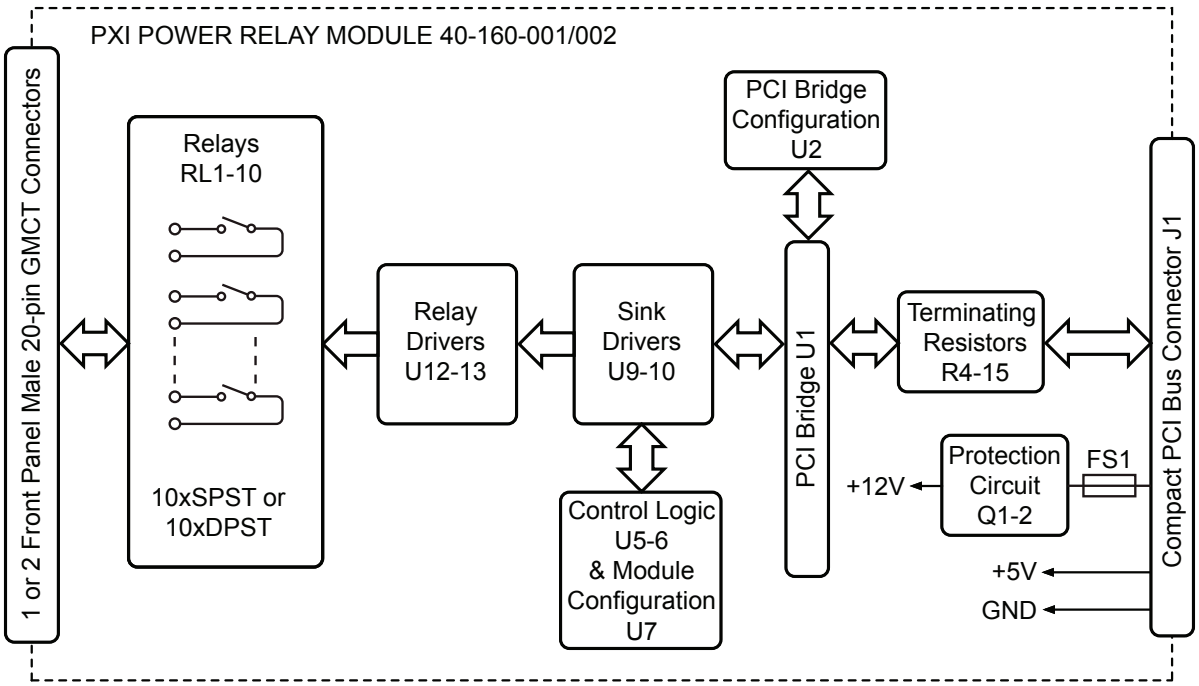


Figure 2.1 - Power Relay Module 40-160-001/002: Functional Block Diagram

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40-160-003

A functional block diagram is provided in Figure 2.2. The Power Relay Module 40-160-003 is powered by +12V and +5V inputs via Compact PCI connector J1. The interface to the user test equipment is via two front panel mounted 20-pin GMCT type connectors. The module comprises a PCB which provides mounting for control logic and twenty 12V relays RL1 to RL20. Relays RL1 to RL5 and RL9 and RL10 are energised via control signals from relay driver U10. Relays RL6 to RL8 and RL11 to RL20 are energised via control signals from relay driver U11. The relay drivers are addressed by PCI bridge U1 to output the required signal. PCI Bridge U1 is configured by EEPROM U2.

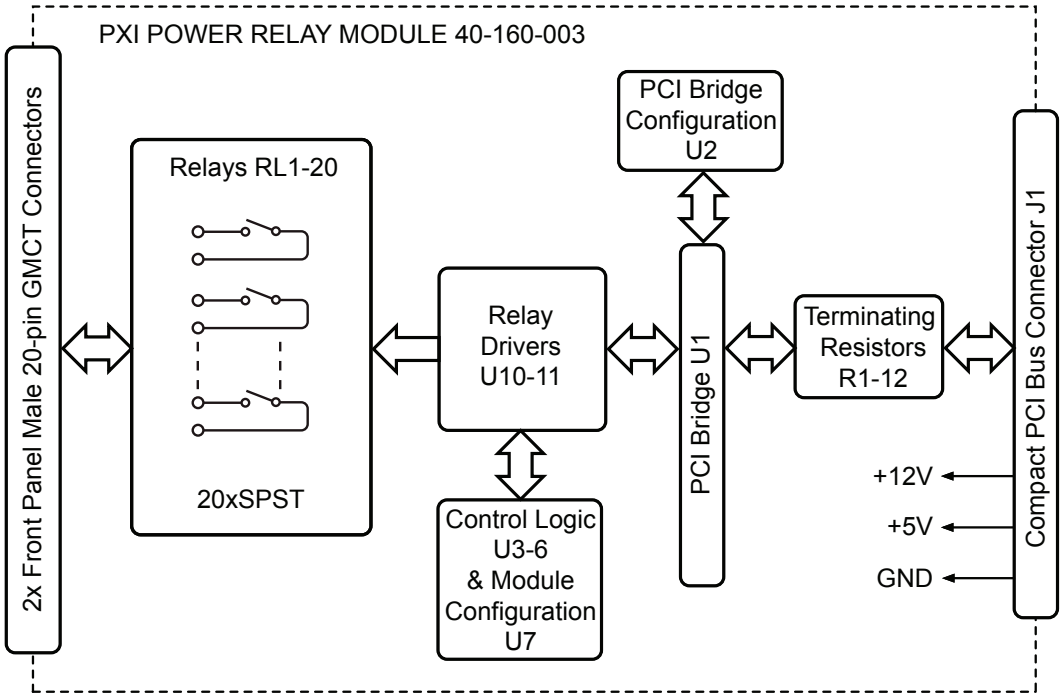


Figure 2.2 - Power Relay Module 40-160-003: Functional Block Diagram

MAXIMUM FREQUENCY OF OPERATIONS AT FULL LOAD

At full load breaking contacts can create a significant amount thermal load inside the relays by the generation of strong signal arcs. If the relays are operated near full load then the rate of operations (a complete on and off cycle) should be limited to a repetition rate of 0.3Hz to avoid the resulting heat damaging the relay plastic components. Repeated operation at closer time intervals under full load will result in premature relay failure.

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SECTION 3 INSTALLATION

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.

Reportez-vous aux Avertissements et Mises en garde au début du manuel.

Les produits modulaires nécessitent une installation dans un châssis PXI/LXI approprié. Le module est conçu pour une utilisation en intérieur.

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 and chassis.

CONTRÔLES AVANT UTILISATION (DÉBALLAGE)

1. Vérifiez que le module n'est pas été endommagé pendant le transport et signalez immédiatement tout dommage à Pickering Interfaces. N'essayez pas d'installer le matériel si des dégâts sont évidents.
2. Placez le châssis contenant le module par rapport à tout autre équipement qui est censé se connecter avec. Assurez-vous que le châssis n'est pas connecté à l'alimentation électrique.
3. Assurez-vous que la zone désignée pour le châssis contenant le module est de construction plate et solide afin de résister et supporter le poids du module et le châssis.

HARDWARE INSTALLATION ELECTRICAL CONNECTION (CHASSIS)

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

INSTALLATION DU MATÉRIEL RACCORDEMENT ÉLECTRIQUE (CHASSIS)

1. Le châssis contenant le module doit être installé électriquement en conformité aux normes en vigueur par un ingénieur qualifié.
2. Le châssis contenant le module doit être mis à la terre.

Les décharges électrostatiques peuvent endommager les composants du module. Pour éviter de tels dommages en manipulant la carte se reporter à la Page VII.

Assurez-vous que la ventilation est adéquate.

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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.

Le module doit être installé conformément à la procédure suivante:

1. Assurez-vous que le système est éteint mais qu'il reste connecté au réseau électrique afin qu'il reste relié à la terre.
2. Choisissez un emplacement approprié dans la baie.
3. Retirez la plaque d'obturation de l'emplacement choisi.
4. Assurez-vous que la poignée insertion / éjection est dans sa position vers le bas. Alignez le module avec les guides de la carte sur le haut et le bas de la fente.

   Ne pas lever la poignée insertion / éjection tout en insérant le module, sinon celui-ci ne sera pas inséré correctement.
5. Tenez la poignée tout en glissant lentement le module dans les guides de la carte jusqu'à la prise des poignées sur le rail insertion / éjection (voir la Figure 3.1).
6. Relevez la poignée insertion / éjection jusqu'à ce que le module se place fermement dans le fond de panier. Le panneau avant du module doit être aligné avec le panneau avant du châssis.
7. Fixez le panneau avant du module en utilisant les deux vis du panneau avant du rail de montage du châssis.
8. Dans un système utilisant une interface de commande à distance, pour connecter un contrôleur externe à un châssis PXI ou pour relier plusieurs châssis, faites la mise sous tension du système comme suit:
   a. Pour un système comprenant un contrôleur externe et un châssis, mettez le châssis avant d'allumer le contrôleur externe.
   b. Pour un système comprenant plus d'un châssis, allumez le dernier châssis dans le système suivi par l'avant-dernier, etc, et enfin activez le contrôleur ou le châssis externe contenant le contrôleur système.
9. Pour l'installation modulaire LXI de Pickering Interfaces, il n'est pas nécessaire d'utiliser une séquence de mise sous tension particulière.

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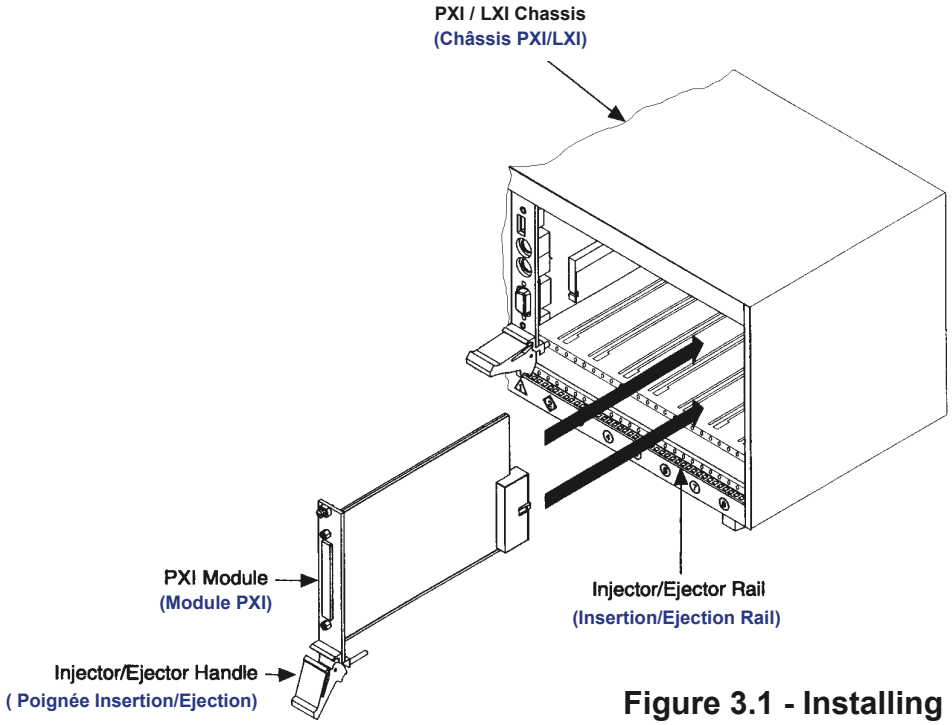


Figure 3.1 - Installing the module into a PXI/cPCI/LXI Chassis

(Figure 3.1 Installation du module dans un châssis PXI/cPCI/LXI)

SOFTWARE INSTALLATION	INSTALLATION DU LOGICIEL
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.	D'abord, installez les pilotes de la carte de commutation PXI de Pickering en exécutant le programme d'installation Setup.exe (fourni dans un fichier compressé zip), soit à partir du CD-ROM fourni, ou en téléchargeant la dernière version sur notre site **pickeringtest.com** - la méthode recommandée. Setup est accompagné d'un fichier "Lisez-moi" contenant des informations supplémentaires sur l'installation. Une seule installation pour toutes les cartes dans les gammes Système 40, Système 45 et Système 50. Une fois l'installation terminée, le pilote installé "Lisez-moi" est offert à l'affichage. Il peut également être affiché ultérieurement à l'aide d'un raccourci dans le menu Programs >> Pickering. Si vous n'êtes pas un utilisateur de LabVIEW, vous devez choisir la version "complète", et une fois qu'elle a été installée. Lancer le programme d'installation LabVIEW Runtime Engine via le raccourci dans le menu Programs >> Pickering. En l'absence de LabVIEW, le Runtime Engine est nécessaire pour supporter l'application Test Panels de Pickering.

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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.

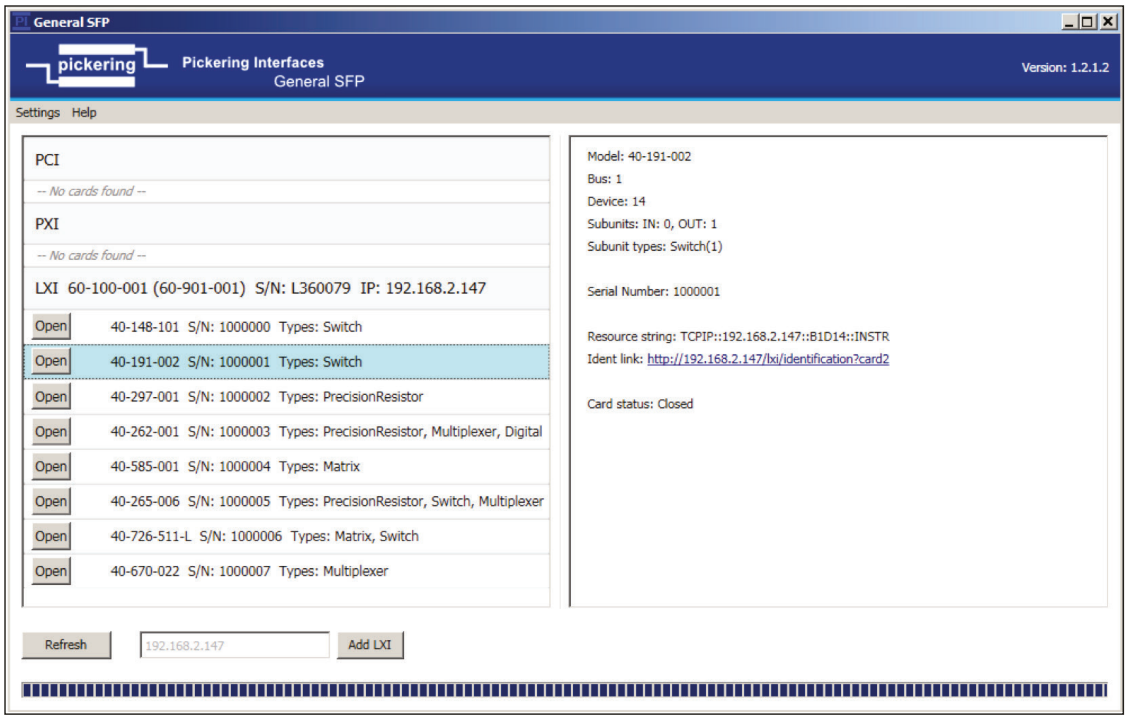


Figure 3.3 - General Soft Front Panel Selector

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 CARDS

Software drivers are supplied for Microsoft Windows operating systems, with specific support for the following development environments:

- Microsoft Visual Studio (VB, C++, C#)
- Borland C++
- National Instruments LabWindows/CVI
- National Instruments LabVIEW and LabVIEW RT

Windows drivers are supplied in the form of Dynamic Link Libraries, which should also be usable in any other development environment that supports them.

Some recent drivers developed for the LXI platform are capable of addressing both PXI and LXI domains. Such duality may be of help to users considering future migration from PXI based systems to LXI based systems, or indeed systems containing both PXI and LXI components.

Programming for PXI

A number of different Windows drivers are available to meet particular system requirements, and should none of these be suitable there is also the option of register-level programming. Drivers are generally ‘universal’, handling all models in the System 40, 45 and 50 ranges; however some models that are not compliant with the Ivi Swtch class cannot be used with the pi40iv IVI driver. The pipx40 and Pilpxi drivers are also applicable to certain models in the System 41 (PXI Instruments) range - see these drivers’ System 41 support list.

Please note that this documentation is available in its most up-to-date form as HTML help files, fully hyperlinked for easy access - both pipx40 and Pilpxi documents are included in the Pipx40vpp software installation.

IVI Driver for Windows - pi40iv

The pi40iv IVI (Interchangeable Virtual Instrument) driver supports all Pickering Interfaces PXI switch cards that are consistent with the Iviswtch class model - as are the great majority of cards in the System 40/45/50 ranges. It integrates well with LabWindows/CVI and LabVIEW, and is fully compatible with Switch Executive. It is also usable in general-purpose programming environments such as Visual C++ and Visual Basic.

Prior installation of the VISA and IviEngine from National Instruments are required for the correct installation and operation of this driver.

VISA Driver for Windows - pipx40

The pipx40 driver conforms to the VISA (Virtual Instrument Software Architecture) standard for programmable instrumentation. Instrument control environments such as LabVIEW and LabWindows/CVI are based on VISA, and pipx40 support libraries are provided for them.

Prior installation of VISA from National Instruments is required for the operation of this driver.

Where VISA is available, pipx40 can also be used in general-purpose programming environments such as Visual C++ and Visual Basic. When IVI is not a system requirement this driver will often yield faster operation than the pi40iv driver.

Direct I/O Driver for Windows - Pilpxi

The Pilpxi driver accesses cards directly, without using the VISA software layer, while offering similar overall functionality to pipx40. It is most commonly used in general-purpose programming environments such as Visual C++ and Visual Basic. Operating speed of the VISA and Direct I/O drivers is generally comparable.

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Register-level Programming

Where the supplied drivers are not suitable, register-level programming can be employed - for example:

- If the functionality of the supplied drivers does not meet the application requirements
- If security considerations demand full source-code for the application
- In development environments that have alternate mechanisms for accessing PCI bus
- For operating systems other than Windows

Programming for LXI

When Pickering PXI cards are inserted into an LXI Modular Chassis a different set of drivers is available.

IVI Driver for Windows - pi40iv

The pi40iv IVI also supports LXI inserted cards simply by changing the resource string to address string to the appropriate address.

Direct I/O Driver for Windows - Piplx

The piplx driver is based on the PXI Direct I/O driver pilpxi, but with added functionality to deal with the added need to address the chassis using an IP address. It integrates well with LabWindows/CVI and LabVIEW, and is fully compatible with Switch Executive. It is also usable in general-purpose programming environments such as Visual C++ and Visual Basic.

Please note that this driver may also be used in the PXI domain. If the addressed card is in the local computer PCI/PXI system, commands will be passed through to the PXI Direct I/O driver. This mechanism allows the piplx driver to be used for both PXI and LXI cards.

The LXI format offers additional interface options not available in PXI :

.NET

A .NET native driver is also available. Once again this may be used for both LXI and PXI card control.

SOAP

Pickering LXI products include a SOAP interface which is usable from a wide variety of platforms and languages.

SSH

Pickering LXI products include an SSH interface which allows remote command line access to control cards, or, using a suitable package, programmatic control.

The user is advised to visit the Pickering web site for further details of all the above drivers, where documentation, example programs, and further help with driver choice are available.

LabVIEW, LabWindows/CVI and Switch Executive are trademarks of National Instruments Corporation.

General Pickering Card Architecture

With most drivers, before programming a Pickering card it is important to understand the basic architecture of Pickering cards.

The switches on a Pickering card are organized into logical sub-units, each sub-unit containing a set of objects of similar type and use. These objects may be switches, digital outputs, digital inputs, resistors, power supplies etc, depending on the nature of the specific card.

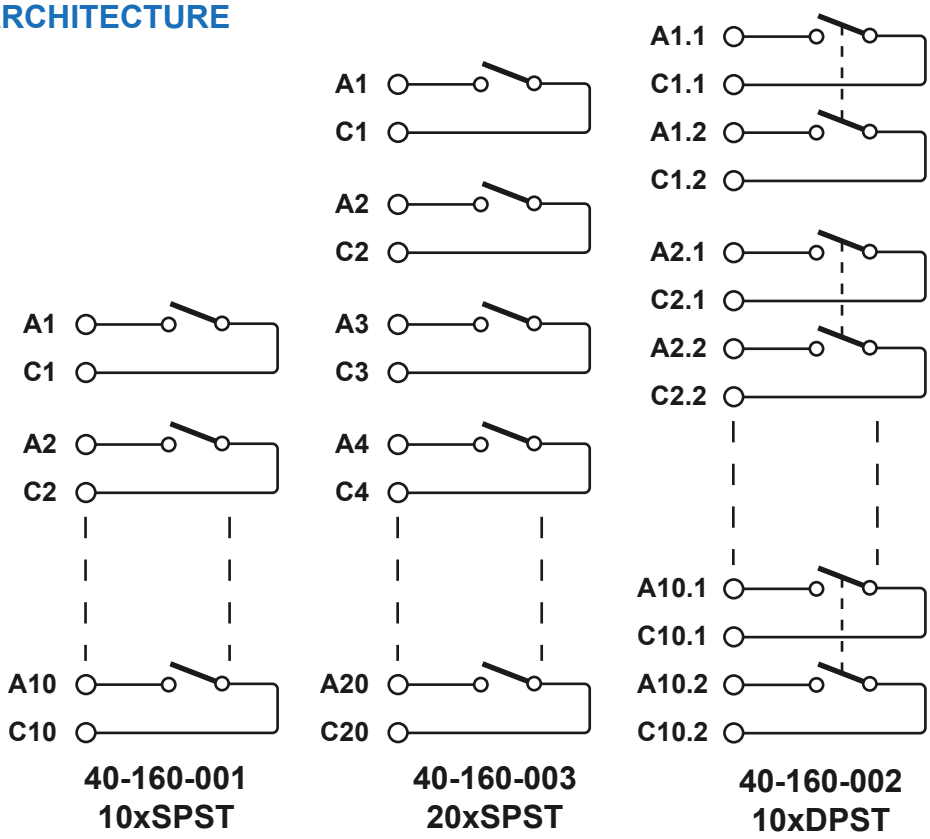
For example a simple matrix card will usually contain a single sub-unit containing the switches arranged in a 2-dimensional array. However a similar card with additional isolating relays connected to the matrix will contain additional sub-units containing those isolation relays.

Low level drivers include functions to allow the programmer to query the card to ascertain the number of sub-units, and the size and type of each sub-unit.

For full details of the driver functions available the programmer should refer to the documentation provided.

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MODULE ARCHITECTURE



The Pickering 40-160 PXI Power Relay Module is available with 10xSPST, 20xSPST or 10xSPDT uncomitted relays. One sub-unit is used to control all the switches as shown below.

Sub-Unit	Bit	Function		
		40-160-001	40-160-002	40-160-003
1	1	A1 to C1	A1.1 to C1.1 & A1.2 to C1.2	A1 to C1
1	2	A2 to C2	A2.1 to C2.1 & A2.2 to C2.2	A2 to C2
1	3	A3 to C3	A3.1 to C3.1 & A3.2 to C3.2	A3 to C3
1	4	A4 to C4	A4.1 to C4.1 & A4.2 to C4.2	A4 to C4
1	5	A5 to C5	A5.1 to C5.1 & A5.2 to C5.2	A5 to C5
1	6	A6 to C6	A6.1 to C6.1 & A6.2 to C6.2	A6 to C6
1	8	A7 to C7	A7.1 to C7.1 & A7.2 to C7.2	A7 to C7
1	8	A8 to C8	A8.1 to C8.1 & A8.2 to C8.2	A8 to C8
1	9	A9 to C9	A9.1 to C9.1 & A9.2 to C9.2	A9 to C9
1	10	A10 to C10	A10.1 to C10.1 & A10.2 to C10.2	A10 to C10
1	11	—	—	A11 to C11
1	12	—	—	A12 to C12
1	13	—	—	A13 to C13
1	14	—	—	A14 to C14
1	15	—	—	A15 to C15
1	16	—	—	A16 to C16
1	17	—	—	A17 to C17
1	18	—	—	A18 to C18
1	19	—	—	A19 to C19
1	20	—	—	A20 to C20

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PROGRAMMING THE MODULE

Here are examples of using the drivers with the 40-160-001

Using PILPXI

To operate a relay the user could use the simple OpBit command or the WriteSub commands

OpBit

```
DWORD sub_unit = 1;
PIL_OpBit( card_num, sub_unit, 1, 1);   // Operates the A1/C1 relay
PIL_OpBit( card_num, sub_unit, 1, 0);   // Releases the A1/C1 relay
PIL_OpBit( card_num, sub_unit, 6, 1);   // Operates the A6/C6 relay
```

WriteSub

```
// Sub-unit is 10 bits wide, so 1 DWORD is needed to hold the pattern
DWORD data[1];
data[0] = 1;                            // Sets lowest bit to 1, A1/C1 relay
PIL_WriteSub( card_num, sub_unit, data);
data[0] = 0x20;                         // Sets 6th bit, A6/C6 relay
PIL_WriteSub( card_num, sub_unit, data);
```

Using PIPX40

setChannelState

```
ViUInt32 sub_unit = 1;
pipx40_setChannelState(vi, sub_unit, 1, VI_ON);     // Operates the A1/C1 relay
pipx40_setChannelState(vi, sub_unit, 1, VI_OFF);    // Releases the A1/C1 relay
pipx40_setChannelState(vi, sub_unit, 6, VI_ON);     // Operates the A6/C6 relay
```

setChannelPattern

```
// Sub-unit is 10 bits wide, so 1 ViUInt32 value is needed to hold the entire pattern
ViUInt32 data[1];
data[0] = 1;                            // Sets lowest bit to 1, A1/C1 relay
pipx40_setChannelPattern( vi, sub_unit, data);
data[0] = 0x20;                         // Sets 6th bit, A6/C6 relay
pipx40_setChannelPattern( vi, sub_unit, data);
```

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, com1, ch1);          // Operates the A1/C1 relay
pi40iv_Disconnect(vi, com1, ch1);       // Releases the A1/C1 relay
pi40iv_Connect(vi, com6, ch6);          // Operates the A6/C6 relay
```

The IVI Swtch driver specification contains no bulk setting capabilities.

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SECTION 5 - CONNECTOR INFORMATION

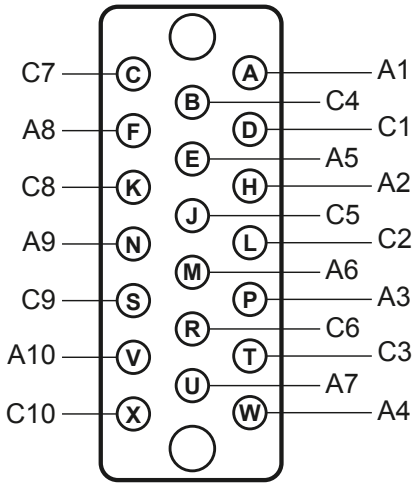


Figure 5.1 - 10 x SPST Power Relay Module 40-160-001: Pinouts (20-pin male GMCT connector viewed from the front of the module)

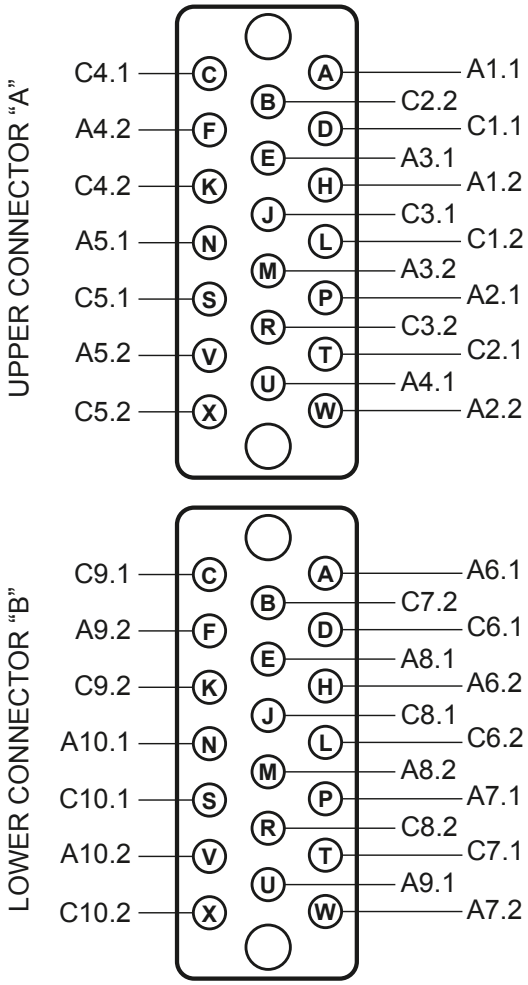


Figure 5.2 - 10 x DPST Power Relay Module 40-160-002: Pinouts (20-pin male GMCT connectors viewed from the front of the module)

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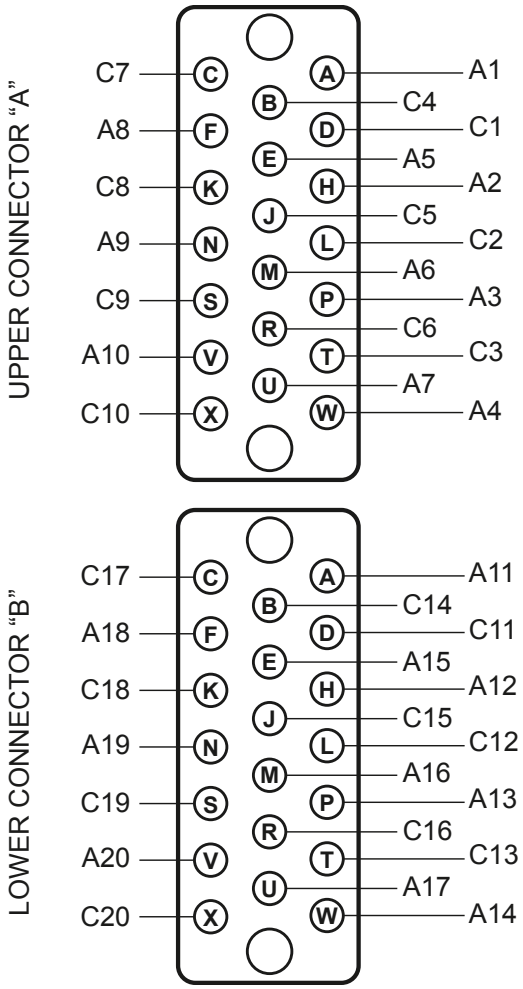


Figure 5.3 - 20 x SPST Power Relay Module 40-160-003: Pinouts (20-pin male GMCT connectors viewed from the front of the module)

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SECTION 6 TROUBLE SHOOTING

SECTION 6 DÉPANNAGE

Refer to the Warnings and Cautions at the front of this manual 	**Reportez-vous aux Avertissements et Mises en garde au début du manuel.** 

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.

PROBLÈMES D'INSTALLATION

La fonctionnalité Plug & Play des cartes de commutation Pickering assure généralement une installation sans problème.

Si vous rencontrez des problèmes d'installation, vous devez d'abord vous assurer que toutes les cartes sont correctement insérées dans les slots. Les cartes mal accouplées peuvent passer inaperçues par le système d'exploitation, ou peuvent être détectées comme une carte d'un type inconnu. Elles peuvent également entraîner le blocage de l'ordinateur à divers stades du démarrage.

Si votre système utilise une interface de commande à distance, vous devez vérifier l'intégrité de tous les liens de l'interface de commande à distance. Lorsque le système est sous tension, et pendant le démarrage de Windows, vous devriez vous attendre à voir l'activité périodique sur l'interface de commande à distance RX / TX indicateur (jaune), de compensation pour ne laisser que les LED PWR/LNK (vert) allumées. Les indicateurs RX/TX doivent montrer une activité lorsque vous tentez d'accéder à une carte.

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.

UTILITAIRE DE DIAGNOSTIC

L'utilitaire de diagnostic Pickering (accessible via les programs >> Pickering >> menu Utilities PXI) génère un rapport de diagnostic de la configuration du système PCI, mettant en évidence les problèmes potentiels de configuration. Les détails spécifiques de toutes les cartes de commutation Pickering installées sont inclus. Toutes les cartes de commutation installées de Pickering doivent être répertoriées dans la section «Information Pilpxi" - si une ou plusieurs cartes manquent, il est possible de déterminer la raison en se référant au détail de la configuration PCI contenu dans le rapport, mais l'interprétation de cette information est loin d'être simple, et la meilleure solution est de contacter le support Pickering: support@pickeringtest.com, si possible, avec une copie du rapport de diagnostic.

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DIAGNOSTIC UTILITY	UTILITAIRE DE DIAGNOSTIC
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.	Dans la section “Informations VISA” si VISA n’est pas installé cette absence sera signalée. Cela n’affecte pas le fonctionnement en utilisant le pilote Direct I/O, et n’est pas un problème, sauf si vous souhaitez utiliser VISA. VISA est une composante de LabWindows/CVI et LabVIEW de National Instruments, il est disponible comme un environnement autonome. Si VISA est présent et s’il est d’une version suffisamment récente, la section «Information Pipx40” devrait présenter une liste similaire pour les «Information Pilpxi”. Veuillez noter que l’utilitaire de diagnostic ne peut pas accéder aux cartes si celles-ci sont actuellement ouvertes par quelques autres applications, telles que les panneaux test ou moniteur de terminal.

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SECTION 7 MAINTENANCE INFORMATION

SECTION 7 INFORMATION SUR L'ENTRETIEN

Refer to the Warnings and Cautions at the front of this manual 	**Reportez-vous aux Avertissements et Mises en garde au début du manuel.** 

PERIODIC MAINTENANCE

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

L'ENTRETIEN PÉRIODIQUE

Ce produit et son châssis correspondant ne nécessitent pas d'entretien périodique.

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.

NETTOYAGE GÉNÉRAL

- Isolez l'alimentation électrique du châssis et assurez-vous qu'aucun signaux d'E/S utilisateur sont appliqués.
- Nettoyez la surface des produits et des châssis uniquement avec un chiffon antistatique propre et sec.

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.

MISE À JOUR LOGICIELLE

Pour les modules PXI opérant dans un châssis PXI, aucune mise à jour du logiciel du module n'est nécessaire. Veuillez-vous référer à notre site Web **pickeringtest.com** où des liens vers la page de téléchargement du logiciel vous fourniront la dernière version du pilote logiciel pour les différents environnements de programmation rencontrés.

Pour les modules PXI qui sont pris en charge dans l'un des châssis modulaire LXI de Pickering Interfaces (comme le 60-102B et 60-103B) aucune mise à jour du logiciel du module n'est nécessaire. Si le module a été introduit après que le châssis LXI ait été fabriqué, le module peut ne pas être reconnu, dans ce cas, le firmware du châssis peut avoir besoin d'une mise à niveau. C'est un processus simple qui est décrit dans le manuel du châssis LXI modulaire.

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.

CONSULTATION TABLEAUX RELAIS

Les pages suivantes fournissent une référence croisée entre les chemins de signaux du module de relais et des relais physiques sur le circuit imprimé. Les tables peuvent être utilisées dans le processus de recherche de défaut et doivent être utilisées en conjonction avec les schémas de disposition de circuits imprimés correspondants pour identifier la position des relais défaillants.

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TABLE 7.1 - Power Relay Module 40-160 Relay Numbering

Signal Path (with relay energised)			RELAY NUMBER
40-160-001	40-160-002	40-160-003	
A1 to C1	A1.1 to C1.1 & A1.2 to C1.2	A1 to C1	RL1
A2 to C2	A2.1 to C2.1 & A2.2 to C2.2	A2 to C2	RL2
A3 to C3	A3.1 to C3.1 & A3.2 to C3.2	A3 to C3	RL3
A4 to C4	A4.1 to C4.1 & A4.2 to C4.2	A4 to C4	RL4
A5 to C5	A5.1 to C5.1 & A5.2 to C5.2	A5 to C5	RL5
A6 to C6	A6.1 to C6.1 & A6.2 to C6.2	A6 to C6	RL6
A7 to C7	A7.1 to C7.1 & A7.2 to C7.2	A7 to C7	RL7
A8 to C8	A8.1 to C8.1 & A8.2 to C8.2	A8 to C8	RL8
A9 to C9	A9.1 to C9.1 & A9.2 to C9.2	A9 to C9	RL9
A10 to C10	A10.1 to C10.1 & A10.2 to C10.2	A10 to C10	RL10
—	—	A11 to C11	RL11
—	—	A12 to C12	RL12
—	—	A13 to C13	RL13
—	—	A14 to C14	RL14
—	—	A15 to C15	RL15
—	—	A16 to C16	RL16
—	—	A17 to C17	RL17
—	—	A18 to C18	RL18
—	—	A19 to C19	RL19
—	—	A20 to C20	RL20

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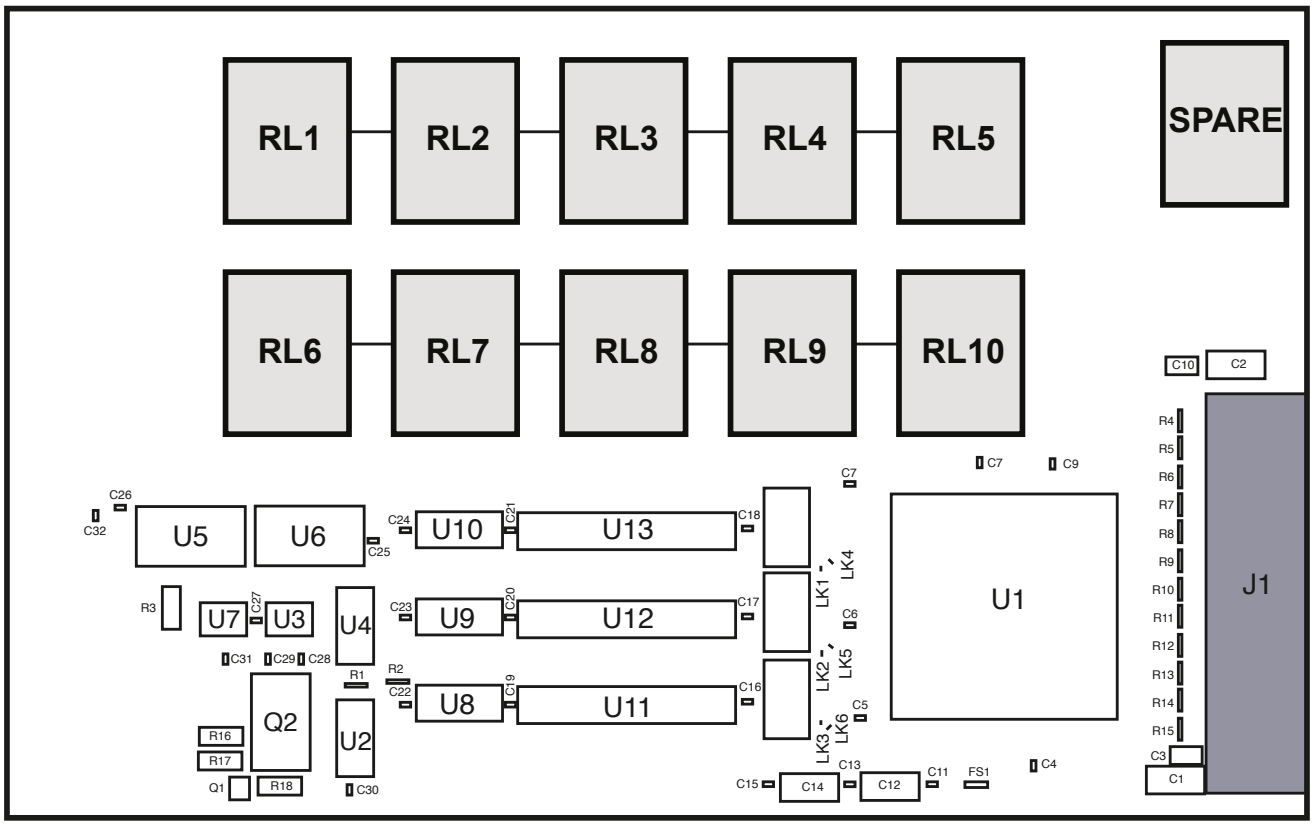


Figure 7.1 - Power Relay Module 40-160-001/002: Relay Locations

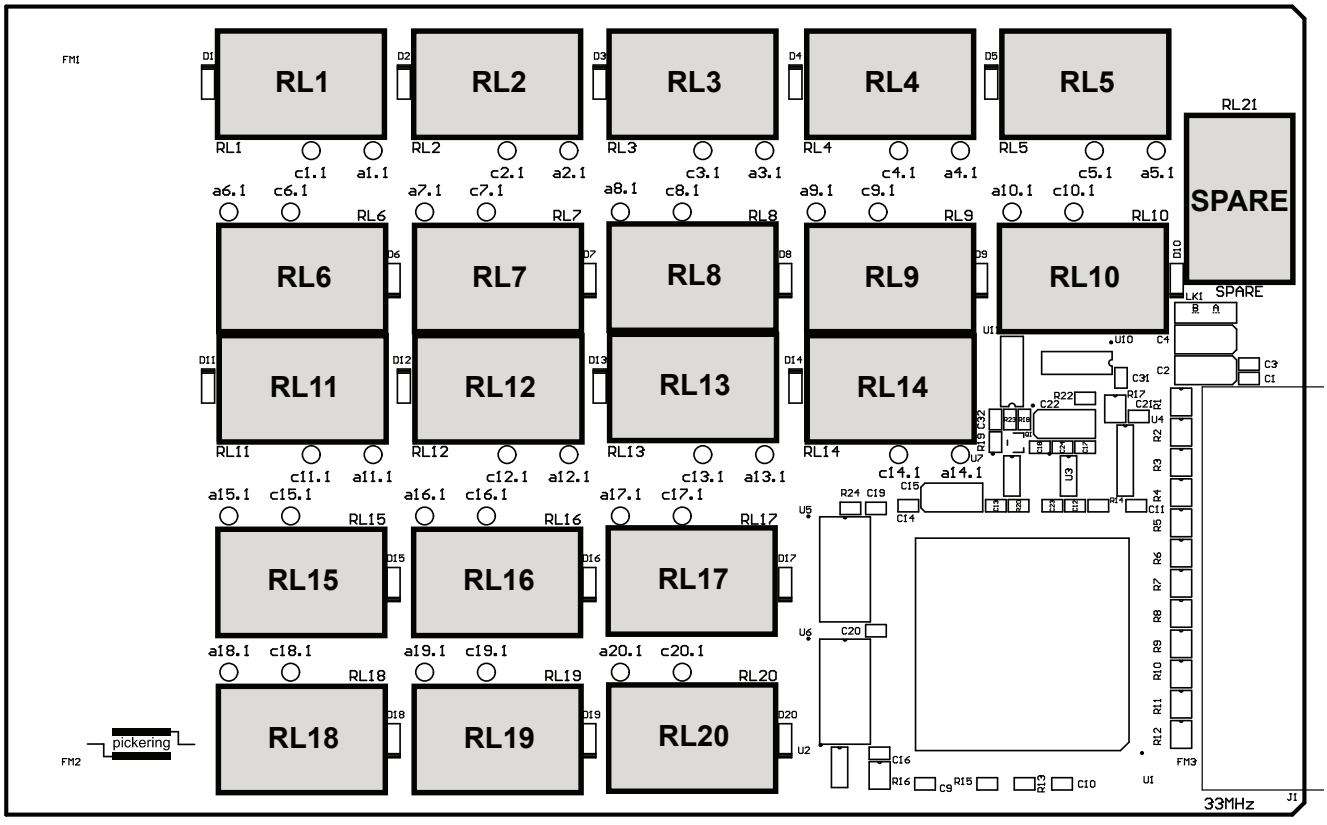


Figure 7.2 - Power Relay Module 40-160-003: Relay Locations

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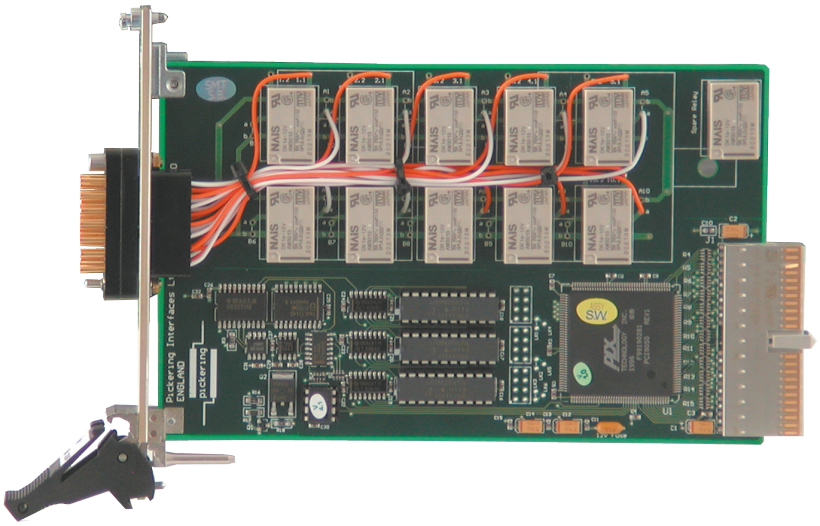


Figure 7.3 - Power Relay Module 40-160-001

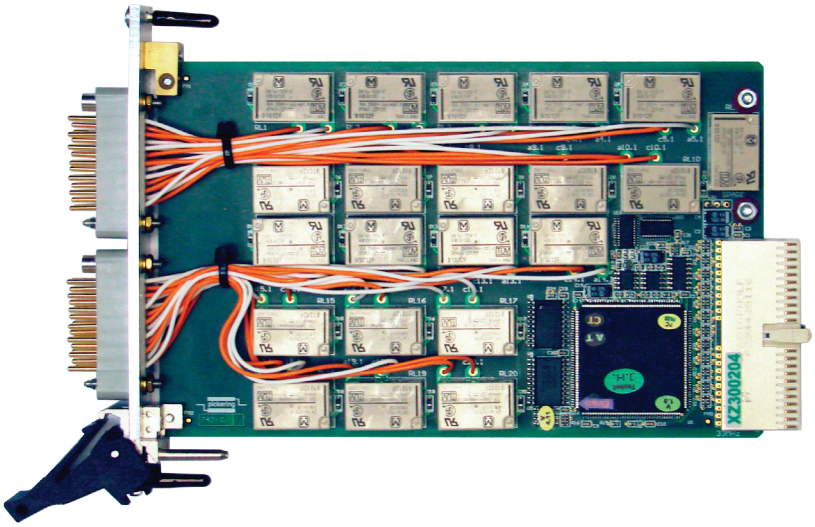


Figure 7.4 - Power Relay Module 40-160-003

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