- **32-Channel Input**
- **Dual Programmable Voltage Threshold, 0.3 to 50V**
- **High Input Voltage Tolerance**

- **32-Channel 40V Output**
- **2A High Side Source Capability (40-413-001)**
- **2A Low Side Sink Capability (40-413-002)**
- **2A High & Low Side Drivers (40-413-003)**
- **Fully Protected Outputs**
- **High Side External Voltage Input**

- **VISA, IVI & Kernel Drivers Supplied for Windows**
- **Supported by PXI or LXI Chassis**
- **3 Year Warranty**

The 40-413 is a 32 channel digital I/O module with high output voltage and current capability and a dual variable threshold input.
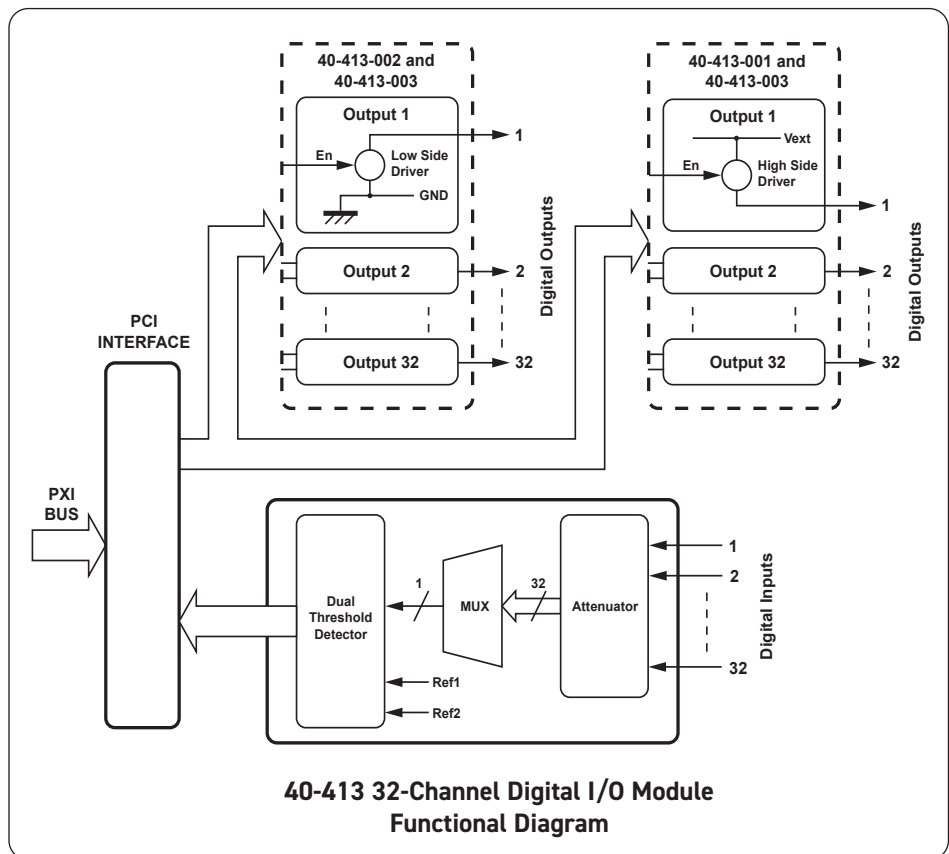
The 40-413 is available in three configurations; high side only, low side only and combined high and low side, each capable of driving 2A loads. Outputs are fully protected against over-voltage, over-current and thermal overload, ensuring robust and reliable operation in the toughest test environments. For high side driving, the voltage source is supplied externally, allowing the module to drive high capacity loads separate from the PXI chassis power supply.

The built in protection systems include an over-voltage clamp so the module can drive relay coils without the use of fly back diodes.

The states of the 32 input channels are read via the PXI interface by comparing the input level to two threshold voltages. These can be set between 0.3V and 50V and have a resolution of 12.5mV. This allows the input to be tested against system limits that define a logic low or logic high.

The driver includes a facility to capture the input status of all 32 channels from a single command. Each input can withstand the accidental application of high external voltage to greater than 100V. The inputs can be connected to the outputs without risk of damage, allowing the module to operate as 32 channels of independent input and output or as 32 channels of configurable I/O.

Connection to the module's input and outputs is via an easy to use 78-pin D-type connector which is fully supported by a range of connector accessories.

40-413 32-Channel Digital I/O Module Functional Diagram

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Output Specification

No. of Output Channels:	32
Output States:	High side only driver 40-413-001, Low side only driver 40-413-002, High and low side driver 40-413-003.
Driver Current:	Capable of sourcing/sinking 2A, module limit of 20A continuous.
Driver Output Resistance:	40-413-001/002, <350mΩ. 40-413-003, <350mΩ low side, <1.3V voltage drop high side at 2A
Output Voltage Range*:	0 to 40V for low side drivers, 11V to 40V (Vext) for high side drivers.
Output Protection:	Current limited, overvoltage limited, thermal protection. Overvoltage limit can be used to limit back emf generated from inductive loads such as relay coils.
Vext*:	User supplied 11V to 40V, applied on multiple pins (5A per pin) of user connector relative to front panel ground. High side driver automatically turns off if Vext is less than typically 9.5V.

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

Input Specification

No. of Input Channels:	32
Logic Threshold:	Compares selected input voltage against two reference voltages, each of which can be set from 0.3 to 50V with 12.5mV setting resolution.
Settling Time:	50µs following a state change or channel selection.
Channel Selection:	Single channel selection or automated sequential access to all 32 channels.
Maximum Input Voltage:	100V*
Input Impedance:	1MΩ

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

Power Requirements

+3.3V	+5V	+12V	-12V
0A	0.1A	0.05A	0.05A

Mechanical Characteristics

Single slot 3U PXI (CompactPCI card).
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 78-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

32-Channel Digital I/O Module, High Side Drive, Programmable Threshold	40-413-001
32-Channel Digital I/O Module, Low Side Drive, Programmable Threshold	40-413-002
32-Channel Digital I/O Module, High & Low Side Drive, Programmable Threshold	40-413-003

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.

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.

Mating Connectors & Cabling

For connection accessories for the 40-413 series please refer to the 90-006D 78-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
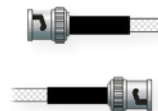- Independence from Windows operating system

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.
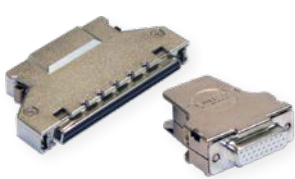
Connectors & Backshells   **Multiway Cable Assemblies**   **RF Cable Assemblies**   **Connector Blocks**

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
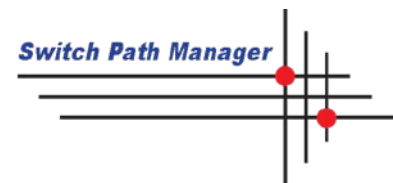
Diagnostic Relay Test Tools

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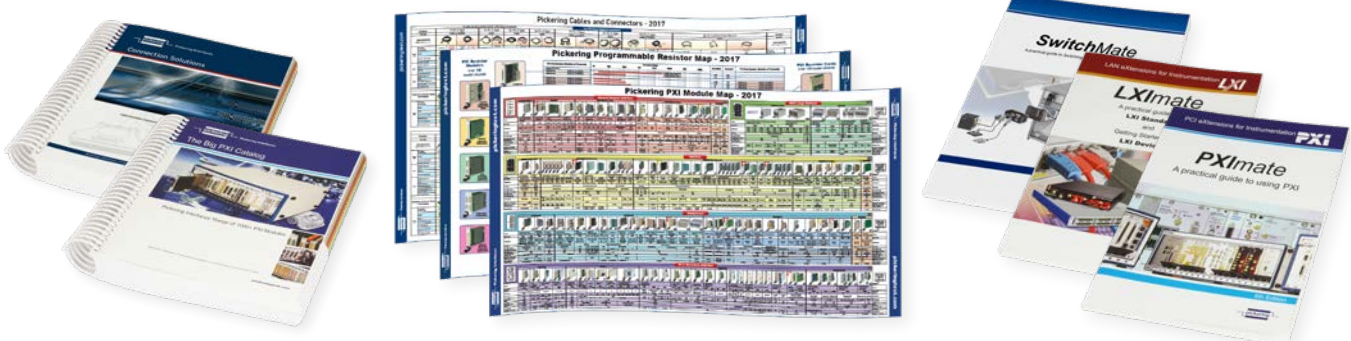
To view, download or request any of our product resources, please visit: pickeringtest.com/resources

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