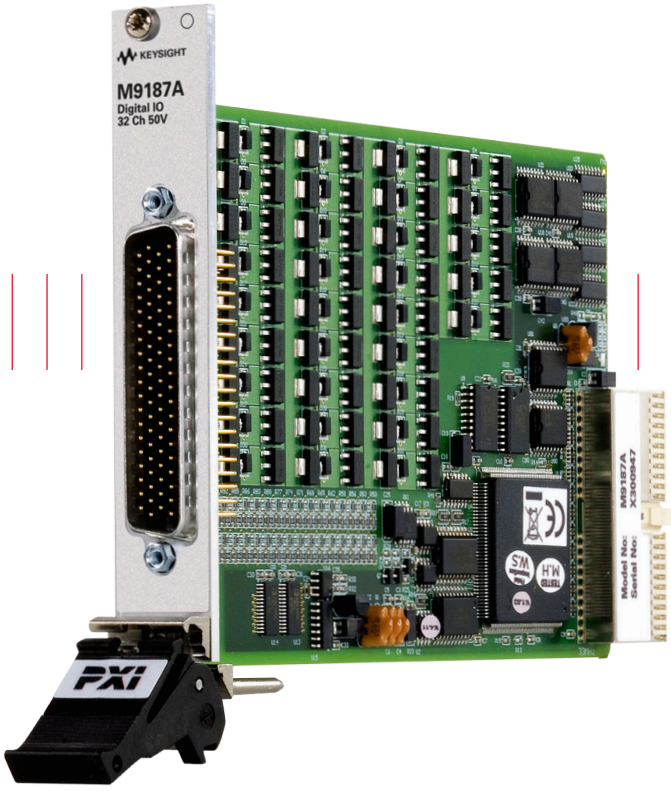
Keysight Technologies
M9187A PXI Digital I/O Control Module

Data Sheet



KEYSIGHT TECHNOLOGIES

Overview

Product Description

The Keysight Technologies, Inc. M9187A module can be configured as 32 channels of independent input and output or 32 channels of configurable I/O. The digital input is designed to accept a wide range of signal inputs by using a configurable signal input threshold. This allows you to read and compare input signals to specific logic high and low voltages, and then acquire the status of individual or all 32 channels with a single command. The digital outputs offer flexibility in configuration with active low- or high-side drive and support for open-collector/open-drain connections.

Installation and configuration is fast and easy with standard cable connections or an optional connector block, soft front panels, and Keysight Connection Expert. In addition, software drivers support the most common programming environments such as Visual Studio, C, C++, Visual Basic, MATLAB, and LabVIEW.

Applications

- Aerospace and defense
- Automotive
- Electronic test
- Medical
- Semiconductor

Features

- Flexible configuration of 32 channels for independent input and output or configurable I/O
- Programmable input thresholds and flexible output drive capability
- Robust input and output protection
- Easier and faster PXI test system development
- Reliable measurements from robust, high-pin-count interconnects
- 32 input channels and 32 output channels
- 50 V input with 100 V over voltage protection and fully protected outputs
- Software drivers support the most common programming environments
- Optional connector block, soft front panels, and Keysight Connection Expert

Customer Values

- Provides the flexibility to meet your testing needs
- Reliable performance
- Work in your programming environment of choice and reduce development time
- Fast and easy module installation and configuration

Easy Setup ... Test ... and Maintenance

Hardware Platform

Compliance

The digital I/O module is PXI compliant with a J1 connector and can be used in a PXI chassis with cPCI (J1), PXI-1 or PXIe hybrid slot connectors.

The PXI format offers high performance in a small, rugged package. It is an ideal deployment platform for many automated test systems. In addition, a wide selection of complementary PXI products are currently available, such as multimeters, waveform generators, local oscillators, and digitizers.

Software Platform

IO Libraries

The Keysight IO Libraries Suite offers a single entry point for connection to the most common instruments including AXIe, PXI, GPIB, USB, Ethernet/LAN, RS-232 and VXI test instruments from Keysight and other vendors. It automatically discovers interfaces, chassis and instruments. The graphical user interface allows you to search for, verify and update IVI instrument and soft front panel drivers. The IO Libraries Suite safely installs in side-by-side mode with NI IO software.

Drivers

Keysight provides instrument drivers that work with your choice of software, saving time and preserving software and hardware investments. Keysight modular instruments come with IVI-COM, IVI-C, and LabVIEW software drivers that work in the most popular test and measurement development environments including LabVIEW, MATLAB, LabWindows/CVI, Visual Studio C, C++, C#, VEE, and Visual Basic.

With a broad selection of drivers already included, any Keysight PXI digital I/O module can be swapped out, replaced, or upgraded with the latest version, requiring only minimal software adjustments.

Easy software integration

Application code examples are included for LabVIEW, LabWindows/CVI, Visual Studio C, C++, C#, Visual Basic, and MATLAB, providing switch setup and basic functionality. These application code examples are easily modified to quickly integrate the switch module into your measurement system.

Software Applications

Keysight soft front panels provide easy-to-use instrument communications. The PXI digital I/O graphical user interface guides developers through module setup so users can quickly configure the switch parameters. More sophisticated functions are also available through the wide selection of instrument program interfaces.

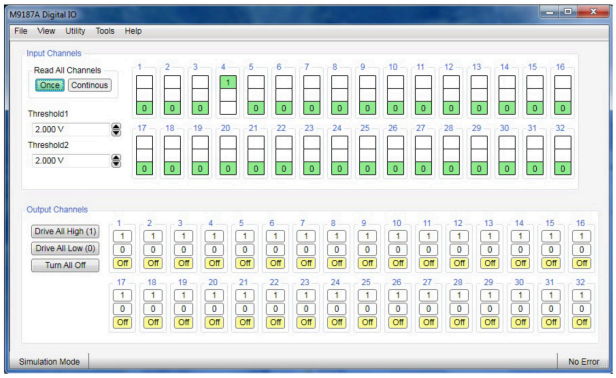


Figure 1. Digital I/O soft front panel

Specifications and Characteristics

M9187A PXI 32-ch Digital I/O

The 32 input channels are attenuated, then multiplexed to a programmable variable threshold detector (configurable between 0.3 and 50 V) that converts input analog signals to digital signals by comparing the input voltages to the user-selected logic high and low voltages. The digital inputs are designed for input signals that are static, or have less frequently changing inputs (< 10 KHz).

The digital outputs are capable of driving relay coils, alarms, and visual indicators. Each of the 32 output channels can either drive the output high and source up to 0.4 A, or, drive the output low and sink up to 0.5 A to the GND terminal. An external voltage supply (+5 V to +50 V) is required for the high-side voltage source, enabling the module to drive high-capacity loads. The low-side does not require an external voltage source allowing use in open collector or open drain driver applications.

The digital I/O module is designed for use in tough test environments and includes protection from over-voltage, over-current, and thermal overload. Connect an input channel to an output channel using external wiring to allow the input channel to verify that the output connection is being driven as expected, or to create software-configurable I/O.

Note, the GND reference in figure 2 is the same as Front Panel Ground ("FP_Gnd"). FP_Gnd is not isolated. It is connected via a 100 Ohm resistor to the PXI power supply unit ground. When the module is inserted into a chassis FP_Gnd is connected to the chassis ground.

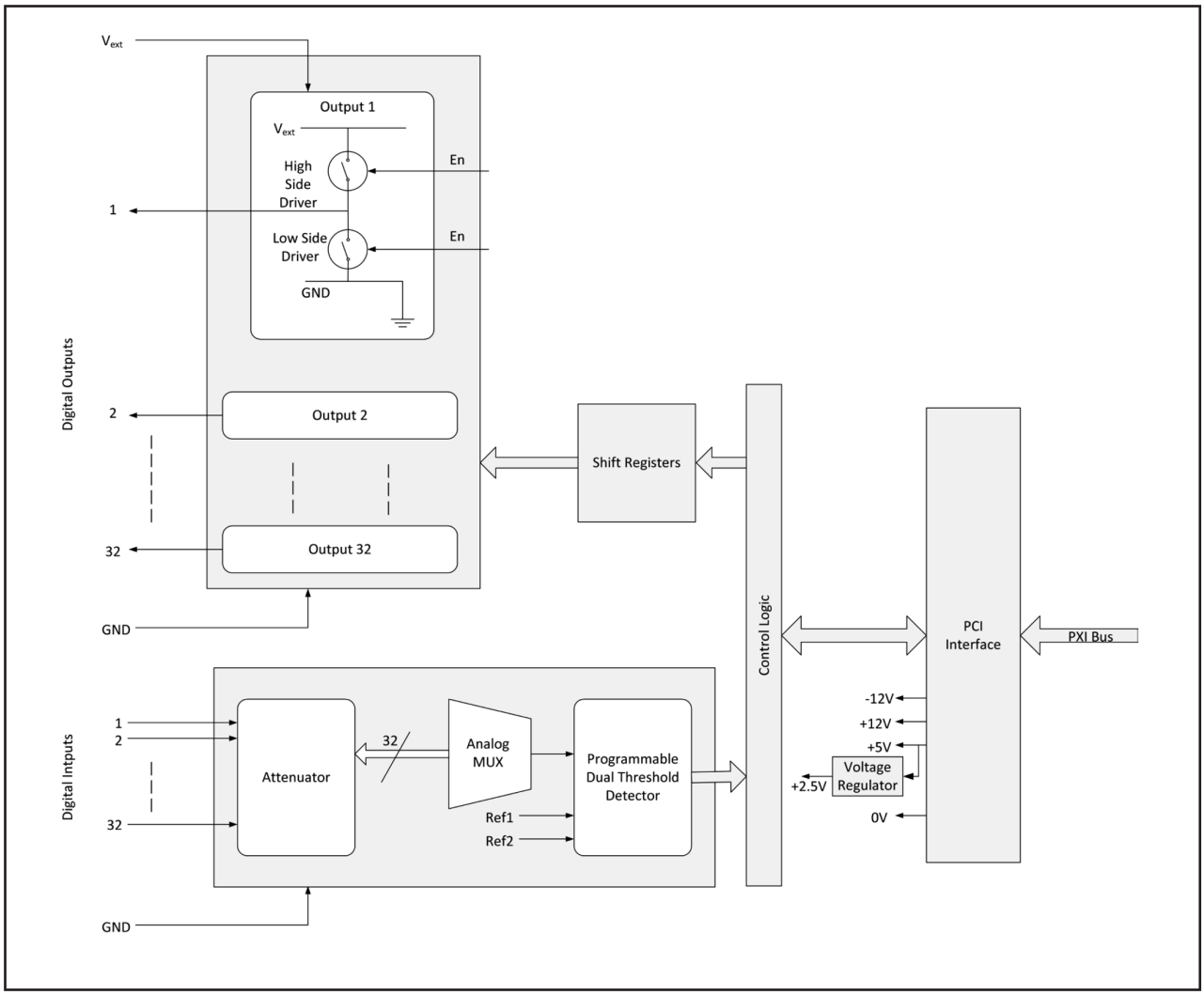


Figure 2. M9187A 32 inputs, 32 outputs, 0.3 V to 50 V.

Specifications and Characteristics (continued)

General specifications	
Channels	32 input and 32 output or 32 bit I/O
Input/output specifications	
Input specifications [1]	
Channels	32 inputs
Impedance **(typical)**	**1 x 10** [5] **Ω, ± 5%**
Max voltage [2]	+50 V
Logic threshold (common to all inputs) Voltage range (for each level) Voltage accuracy **(typical)** Resolution **(typical)**	Dual levels +0.3 V to +50 V **± 200 mV** **12.21 mV (50 V/4095 counts)**
Readback settling time [3]	50 µS
Output specifications [1]	
Channels	32 outputs
Max voltage	+50 V
Output states, individually controlled per channel	Driven high, driven low, off
Low-side driver [4] Max current Resistance (at max current) **(typical)** Off state drain current	 0.5 A per channel, 10 A total per module **< 700 mΩ** 5 uA
High-side driver V^{ext}t (user supplied, common to all outputs) [5] Output voltage Max current Standby current	 +5 to +50 V V^{ext} to 1.5 V 0.4 A per channel, 10 A total per module 2 uA (typical)/10 uA (maximum)
Output protection [6, 7]	Current limited, over voltage, thermal
Output states	Driven high, driven low, or off

1. Input and output channels may be wired together by the user for software configurable I/O.
2. Inputs are overvoltage protected to 100 V.
3. Read back settling time required after threshold change, input change, or channel selection.
4. V^{ext} connection not required for open collector/open drain low-side drive.
5. Relative to front panel ground connections.
6. Overvoltage limit allows direct drive of inductive loads such as relay coils.
7. All high side drivers are in connected together in a single bank on the PCB. Do not apply different voltages to the V^{ext} pins

Specifications and Characteristics (continued)

General specifications	
Slot type	PXI 1 slot
Connector type	78-pin Dsub connector block or cable
Environmental characteristics [1,2]	
Temperature	Operating: 0° to 55°C Non-operating: –40° to +70°C
Relative humidity	Relative humidity: Up to 95% R.H. at 40° C, non-condensing, pollution degree [1]
EMC	European EMC Directive 2004/108/EC – IEC/EN 61326-1 – CISPR Pub 11 Group 1, Class A – AS/NZS CISPR 11 – ICES/NMB-001 Canadian ISM device ICS-001
Safety	European Low Voltage Directive 2006/95/EC - ETL, UL/IEC/EN 61010-1, 2nd Edition
Altitude under relative humidity	Altitude: up to 4.6 km (15,000 ft)
Warm-up time	45 minutes, max

1. Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to temperature, humidity, shock, vibration, altitude, and power line conditions.
2. Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F class 3.

Physical characteristics	
Dimensions	– 3U/1-slot PXI/CompactPCI® standard – Connector slot compatibility: cPCI (J1), PXI-1, PXIe hybrid slot – Front panel complies with IEEE1101.10 certification and compliance
Weight	0.16 kg (0.35 lbs)
Power requirements (max), (nominal)	
5 V	100 mA
3.3 V	0 mA
+12 V	50 mA
–12 V	50 mA

Specifications and Characteristics (continued)

System requirements			
Operating systems	Windows XP, Service Pack 3 or later (32-bit)t	Windows Vista, SP1 and SP2 (32-bit and 64-bit), Business, Ultimate, Enterprise, Home Basic, and Home Premium	Windows 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, Enterprise
Processor speed	600 MHz or higher required 800 MHz recommended	1GHz 32-bit (x86), 1GHz 64-bit (x64), no support for Itanium 64	1GHz 32-bit (x86), 1GHz 64-bit (x64), no support for Itanium 64
Available memory	256 MB minimum (1 GB or greater recommended)	1 GB minimum	1 GB minimum
Available disk space[1]	1.5 GB available hard disk space, includes: – 1 GB available for Microsoft .NET Framework 3.5 SP1[2] – 100 MB for Keysight IO Libraries Suite	1.5 GB available hard disk space, includes: – 1 GB available for Microsoft .NET Framework 3.5 SP1[2] – 100 MB for Keysight IO Libraries Suite	1.5 GB available hard disk space, includes: – 1 GB available for Microsoft .NET Framework 3.5 SP1[2] – 100 MB for Keysight IO Libraries Suite
Video	Super VGA (800x600) 256 colors or more	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)
Browser	Microsoft Internet Explorer 6.0 or greater	Microsoft Internet Explorer 7 or greater	Microsoft Internet Explorer 7 or greater

1. Because of the installation procedure, less memory may required for operation than is required for installation
2. NET Framework Runtime Components are installed by default with Windows Vista and Windows 7. Therefore, you may not need this amount of available disk space.

Configuration and Ordering

Hardware

Model	Description
M9187A	PXI digital I/O: 32 inputs, 32 outputs, 0.3 V to 50 V
Includes:	Getting started guide, software drivers, and Keysight I/O libraries

Accessories

Model	Description
Y1181A	PXI connector block: 78-pin, shielded, female Dsub
Y1187A	PXI connector cable: 78-pin, male-to-female, 1 meter
Y1188A	PXI connector cable: 78-pin, male-to-female, 2 meter

Recommended Chassis Configuration

For the ultimate in speed and flexibility, combine your switches with other PXI modules in the Keysight M9018A PXIe chassis as follows:

- Select a PXIe system module, PCIe cable interface, or embedded controller (the Keysight M9021A is recommended)
- If an external computer is being used, select an appropriate PC interface card (the Keysight M9048A is recommended with an external PC)
- Select an appropriate cable to connect the computer interface board to the system module (the Y1202A is recommended to connect the M9048A and M9021A)
- Select rack mount and EMC filler panel kits as required

Related Products

Model	Description
M9018A	18-slot PXIe chassis: 18-slot, 3U, 8GB/s
M9021A	PCIe cable interface: Gen 2, x8
M9045B	PCIe ExpressCard adaptor: Gen 1
Y1200B	PCIe cable: x4 to x8, 2.0m (used with M9045A)
M9048A	PCIe desktop PC adapter: Gen 2, x8
Y1202A	PCIe cable: x8, 2.0m (used with M9048A)

Software

Model	Description
Supported operating systems	Microsoft Windows XP (32-bit), Microsoft Windows Vista (32/64-bit) Microsoft Windows 7 (32/64-bit)
Standard compliant drivers	IVI-COM, IVI-C, LabVIEW, MATLAB
Supported application development environments (ADE)	VisualStudio (VB.NET, C#, C/C++), LabVIEW, LabWindows/CVI, MATLAB
Keysight IO Libraries	Includes: VISA Libraries, Keysight Connection Expert, IO Monitor

Definitions for specifications

Specifications describe the warranted performance of calibrated instruments that have been stored for a minimum of 2 hours within the operating temperature range of 0 to 55 °C, unless otherwise stated, and after a 45 minute warm-up period. Data represented in this document are specifications unless other wise noted.

Characteristics describe product performance that is useful in the application of the product. Characteristics are often referred to as Typical or Nominal values.

- Typical describes characteristic performance, which 80% of the instruments will meet when operated over a 20 to 30 °C temperature range. Typical performance is not warranted.
- Nominal describes representative performance that is useful in the application of the product when operated over a 20 to 30 °C temperature range. Nominal performance is not warranted.

Note: All graphs contain measured data from several units at room temperature unless otherwise noted.

Calibration

Advantage Services: Calibration
Keysight Advantage Services is committed to your success throughout your equipment's lifetime

Calibration	
R-50C-011-3	3-year calibration assurance plan (return to Keysight)
R-50C-011-5	5-year calibration assurance plan (return to Keysight)

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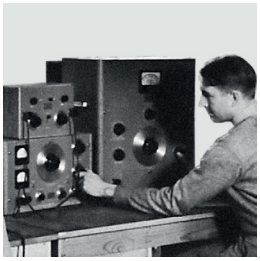

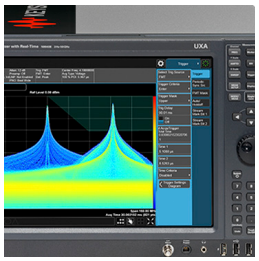



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