Low-Cost M Series Multifunction DAQ – 16-Bit, 250 kS/s, up to 80 Analog Inputs

NI M Series – Low-Cost

- NI recommends high-speed M Series for 5X faster sampling rates, high-accuracy M Series for 4X higher resolution, or industrial M Series for 10X better noise rejection
- 16, 32, or 80 analog inputs at 16 bits, 250 kS/s
- Up to 4 analog outputs at 16 bits, 833 kS/s (6 µs full-scale settling time)
- Programmable input range (±10, ±5, ±1, ±0.2 V) per channel
- Up to 48 TTL/CMOS digital I/O lines (up to 32 hardware-timed at 1 MHz)
- Two 32-bit, 80 MHz counter/timers
- Digital triggering
- NI-MCal calibration technology for improved measurement accuracy
- 6 DMA channels for fast data throughput
- X1, X2, or X4 quadrature encoder inputs

Operating Systems
- Windows Vista/XP/2000
- Mac OS X
- Linux®

Recommended Software
- LabVIEW
- LabWindows™/CVI
- Measurement Studio

Other Compatible Software
- LabVIEW SignalExpress
- ANSI C/C++
- C# and Visual Basic .NET
- Visual Basic 6.0

Measurement Services Software (included)[1]
- NI-DAQmx driver software
- Measurement & Automation Explorer configuration utility
- LabVIEW SignalExpress LE data-logging software

[1]Mac OS X users must download NI-DAQmx Base driver.

Family	Bus	Analog Inputs	Analog Input Resolution (bits)	Analog Outputs	Output Resolution (bits)	Max Output Rate (kS/s)	Analog Output Range (V)	Digital I/O	Correlated (clocked) DIO
NI 6220	PCI, PXI	16	16	–	–	–	–	24	8, up to 1 MHz
NI 6221	PCI, PXI, USB	16	16	2	16	833	±10	24	8, up to 1 MHz
NI 6221 (37-Pin)[1]	PCI	16	16	2	16	833	±10	10	2, up to 1 MHz
NI 6224	PCI, PXI	32	16	–	–	–	–	48	32, up to 1 MHz
NI 6225[2]	PCI, PXI, USB	80	16	2	16	833	±10	24	8, up to 1 MHz
NI 6229	PCI, PXI, USB	32	16	4	16	833	±10	48	32, up to 1 MHz

[1]37-Pin multifunction DAQ devices are not compatible with NI SCC or SCXI platforms. [2] USB devices are not compatible with SCXI signal conditioning.

Table 1. Low-Cost M Series Selection Guide

Overview and Applications

National Instruments M Series low-cost multifunction data acquisition (DAQ) devices provide optimized functionality for cost-sensitive applications. Low-cost M Series devices have up to 80 analog inputs, 48 digital I/O lines, four analog outputs, two counter/timers, and digital triggering. Low-cost M Series devices have a one-year calibration interval. For better accuracy, faster speeds, and an extended two-year calibration service, consider the high-speed and high-accuracy M Series devices.

M Series for Test

For test, you can use 16-bit, 250 kS/s analog inputs and 1 MHz digital lines with NI signal conditioning for applications including data logging and sensor measurements. Low-cost M Series devices are compatible with National Instruments SCC and SCXI signal conditioning platforms, which provide amplification, filtering, and power for virtually every type of sensor. These platforms also are compliant with IEEE 1451.4 smart transducer electronic data sheet (TEDS) sensors, which provide digital storage for sensor data sheet information.

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M Series for Control

Low-cost M Series digital lines can drive 24 mA for relay and actuator control. With up to four analog outputs, two 80 MHz counter/timers, and six DMA channels, M Series devices can execute multiple control loops simultaneously. Low-cost M Series devices also have direct support for encoder measurements, protected digital lines, and digital debounce filters for control applications. With up to 80 analog inputs, 32 clocked digital lines at rates of 1 MHz, and four analog outputs, you can execute multiple control loops with a single device. For higher-count control loops, you can use M Series devices in conjunction and tightly synchronized with National Instruments analog output devices for 64 or more loops.

M Series for Design

You can use the wide range of I/O – from 80 analog inputs to 48 digital lines – to measure and verify prototype designs. M Series devices and National Instruments LabVIEW SignalExpress interactive measurement software deliver benchtop measurements to the PC. With NI LabVIEW SignalExpress interactive configuration-based steps, you can quickly create design verification tests. The fast acquisition and generation rates of low-cost M Series devices along with LabVIEW SignalExpress provide on-the-fly design analysis. You can convert your tested and verified LabVIEW SignalExpress projects to LabVIEW applications for immediate M Series DAQ use and bridge the gap between test, control, and design applications.

Hybrid-Slot-Compatible PXI Modules

PXI M Series modules are hybrid-slot-compatible so that you can use them in both PXI slots and the hybrid slots found in new PXI Express chassis. The PXI Systems Alliance specifies that hybrid-slot-compatible PXI modules use modified slot connectors to mechanically fit in both PXI slots and hybrid slots. This mechanical change:

• Provides compatibility with past, current, and future PXI chassis
• Maintains existing product specifications
• Requires no software changes (application or driver)
• Maintains speed and capability of all PXI communication
  (PXI Express signaling is not provided)

However, hybrid-slot-compatible PXI modules do not include the pins used to implement PXI local bus communication, which is used for backplane SCXI control from the right most PXI slot in PXI/SCXI combination chassis (PXI-1010, PXI-1011, PXI-1050, and PXI-1052). For these applications, NI provides unmodified PXI M Series modules that maintain the required local bus capabilities. Refer to the SCXI Control of PXI/SCXI Combination Chassis section in the Ordering Information section for part numbers.

Simultaneous and Intelligent Data Acquisition

When you need to obtain performance from a data acquisition device beyond the capabilities of a multifunction DAQ device, National Instruments provides simultaneous sampling with NI S Series and intelligent DAQ with NI R Series. The S Series architecture dedicates an ADC per channel to provide higher aggregate sampling rates compared to multiplexed devices. S Series devices are ideal for applications including IF digitization, transient recording, ultrasound and sonar testing, and high-energy physics.

The R Series multifunction data acquisition devices contain an FPGA that is reconfigurable using the LabVIEW FPGA Module. R Series multifunction devices combine analog input, analog output, and digital I/O on a single device. You can customize these devices to develop capabilities such as complete control over the synchronization and timing of all signals and operations; user-defined onboard decision-making logic; and digital lines individually configurable as input, output, counter/timers, PWM, flexible encoder inputs, or user-defined communication protocols.

Industrial Data Acquisition

When you need performance and accuracy from a data acquisition device in an electrically noisy or harsh environment, National Instruments provides industrial M Series, S Series, and digital I/O devices. NI industrial DAQ devices offer a set of high-reliability features, including isolation, ±20 mA current I/O, 24 V digital logic levels, and digital debounce filters. Isolation prevents ground loops, rejects high common-mode voltages, and protects users and equipment from high-voltage transients. Four to 20 mA current loops are immune to most sources of electrical noise and voltage (IR) drops along extensive cable lengths. Sourcing or sinking 24 V digital I/O interfaces directly with pumps, valves, relays, and other industry-standard sensors and actuators; and programmable debounce filters remove glitches and spikes from switches and relays connected to digital input lines.

Recommended Accessories

Signal conditioning is required for sensor measurements or voltage inputs greater than 10 V. National Instruments SCXI is a versatile, high-performance signal conditioning platform optimized for high-channel-count applications. NI SCC provides portable, flexible signal conditioning options on a per-channel basis. Visit **ni.com/sigcon** for resources on available NI signal conditioning.

The National Instruments PCI-6221 (37-Pin) offers a 37-pin D-Sub connector that lowers connectivity costs by 80 percent. The D-Sub connector makes the NI PCI-6221 (37-Pin) ideal for OEM applications. For applications that do not require signal conditioning, refer to Table 2 for recommended cabling and accessories.

Recommended Software

National Instruments measurement services software, built around NI-DAQmx driver software, includes intuitive application programming interfaces, configuration tools, I/O assistants, and other tools designed to reduce system setup, configuration, and development time. National Instruments recommends using the latest version of NI-DAQmx driver software for application development in National Instruments LabVIEW, LabWindows/CVI, ANSI C/C++, C#, Visual Basic .NET, and Visual Basic 6.0.

To download the most recent version of NI-DAQmx software, visit **ni.com/support/daq/versions**. Mac OS X users can program M Series devices with NI-DAQmx Base driver software. M Series devices are compatible with the following versions (or later) of NI application software – LabVIEW, LabWindows/CVI, or Measurement Studio versions 7.x; LabVIEW SignalExpress 1.x; VI Logger 2.0; or LabVIEW with the LabVIEW Real-Time Module 7.1. M Series devices are not compatible with the Traditional NI-DAQ (Legacy) driver.

M Series	Feature	Connect to …	Connector[1]	Cable[2]	Cable Adapter	Accessory
68-pin devices	Noise-reducing	SCC portable signal conditioning	0 or 1	SHC68-68-EPM	–	See **ni.com/sigcon** or SCC-68
	Noise-reducing	SCXI high-performance signal conditioning	0 only	SHC68-68-EPM	–	See **ni.com/sigcon**
	Noise-reducing	Screw terminals	0 or 1	SHC68-68-EPM	–	SCC-68, SCB-68, or TBX-68
	Noise-reducing	Screw terminals (PXI only)	0 only	–	–	TB-2706
	Noise-reducing	BNC terminal block	0 or 1	SHC68-68-EPM	–	BNC-2110, BNC-2111, BNC-2120, or BNC-2090
	Noise-reducing	50-pin connector	0 or 1	SHC68-68-EPM	68M-50F-MIO	Custom-built or third-party
	Basic shielding	Screw terminals	0 or 1	SHC68-68	–	SCB-68, CB-68LP, or CB-68LPR
	Low-cost	Screw terminals	0 or 1	RC68-68	–	CB-68LP or CB-68LPR
	Custom connectivity	Board mounting connectors	0 or 1	SHC68-68-EPM	–	PCB mounting connectors
	Custom connectivity	68-pin female connector	0 or 1	SHC68-68M-EPM	–	Custom-built or third-party
	Custom connectivity	Unterminated	0 or 1	SHC68-NT-S	–	Custom-built or third-party
37-pin devices	Low-cost	Screw terminals	0 only	SH37F-37M-1	–	CB-37FH, CB-37FV
	Low-cost	Screw terminals	0 only	–	–	CB-37F-LP

[1]Connector 0 is found on all M Series devices. 0 and 1 require two cables and accessories and are available on NI 6224, NI 6225, and NI 6229 devices.
[2]For NI 6225, use SHC68-68-EPM on connector 0 and SHC68-68 on connector 1.

Table 2. Recommended Accessories

Ordering Information

PCI

NI PCI-6220..779065-01
NI PCI-6221..779066-01
NI PCI-6221 (37-Pin) 779418-01
NI PCI-6224..779067-01
NI PCI-6225..779295-01
NI PCI-6229..779068-01

PXI

NI PXI-6220..779112-01
NI PXI-6221..779629-01
NI PXI-6224..779114-01
NI PXI-6225..779296-01
NI PXI-6229..779630-01

SCXI Control of PXI/SCXI Combination Chassis

NI PXI-6221..779113-01
NI PXI-6229..779115-01

Data Acquisition Services

Data Acquisition: 7 Steps to Success 779489-01

BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to **ni.com/daq**.

NI Services and Support

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Hardware Services

NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with **ni.com/pxiadvisor**.

Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit **ni.com/calibration**.

Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit **ni.com/services**.

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