

High-Speed M Series Multifunction DAQ – 16-Bit, up to 1.25 MS/s, up to 80 Analog Inputs

NI M Series – High-Speed

- NI recommends high-accuracy M Series for 5X more measurement sensitivity or industrial M Series for 10X better noise rejection
- 16, 32, or 80 analog inputs at 16 bits, 1.25 MS/s (1 MS/s scanning¹)
- Up to 4 analog outputs at 16 bits, 2.8 MS/s (2 μ s full-scale settling)
- 7 programmable input ranges (± 100 mV to ± 10 V) per channel
- Up to 48 TTL/CMOS digital I/O lines (up to 32 hardware-timed at 10 MHz)
- Two 32-bit, 80 MHz counter/timers
- Analog and digital triggering
- NI-MCal calibration technology for improved measurement accuracy
- 6 DMA channels for high-speed data throughput
- X1, X2, or X4 quadrature encoder inputs
- 2-year calibration interval

¹NI 6255 specified at 750 KS/s scanning.

Operating Systems

- Windows Vista/XP/2000
- Mac OS X
- Linux[®]

Recommended Software

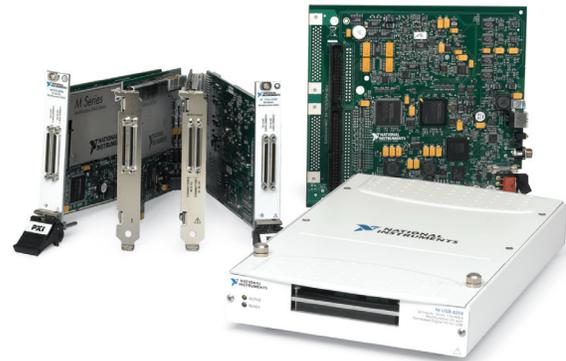
- LabVIEW
- LabWindows™/CVI
- Measurement Studio

Other Compatible Software

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

Measurement Services Software (included)³

- NI-DAQmx driver software
- Measurement & Automation Explorer configuration utility
- LabVIEW SignalExpress LE data-logging software



²USB devices and PXI Express supported only in Windows XP/2000.

³Mac OS X users must download NI-DAQmx Base driver.

Family	Bus	Analog Inputs	Analog Input Resolution (bits)	Analog Outputs	Analog Output Resolution (bits)	Max Output Rate (MS/s)	Analog Output Range (V)	Digital I/O	Correlated (clocked) DIO
NI 6250	PCI, PXI	16	16	0	–	–	–	24	8, up to 10 MHz
NI 6251 ¹	USB, PCI Express, PCI, PXI Express, PXI	16	16	2	16	2.8	$\pm 10, \pm 5, \pm \text{ext ref}$	24	8, up to 10 MHz ²
NI 6254	PCI, PXI	32	16	0	–	–	–	48	32, up to 10 MHz
NI 6255	PCI, PXI	80	16	2	16	2.8	$\pm 10, \pm 5, \pm \text{ext ref}$	24	8, up to 10 MHz
NI 6259 ¹	USB, PCI Express, PCI, PXI Express, PXI	32	16	4	16	2.8	$\pm 10, \pm 5, \pm \text{ext ref}$	48	32, up to 10 MHz ²

¹USB devices are not compatible with SCXI signal conditioning.

²USB devices can clock DIO up to 1 MHz across the bus and up to 10 MHz using onboard regeneration.

Table 1. High-Speed M Series Selection Guide

Overview and Applications

National Instruments M Series high-speed multifunction data acquisition (DAQ) devices are optimized for superior accuracy at fast sampling rates. They have an onboard NI-PGIA 2 amplifier designed for fast settling times at high scanning rates, ensuring 16-bit accuracy even when measuring all channels at maximum speeds. All high-speed devices have a minimum of 16 analog inputs, 24 digital I/O lines, seven programmable input ranges, analog and digital triggering, two counter/timers, and an extended two-year calibration interval.

M Series for Test

For test, you can use M Series high-speed analog inputs and 10 MHz digital lines with NI signal conditioning for applications including electronics test, component characterization, and sensor measurements. High-speed 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

M Series digital lines can drive 24 mA for relay and actuator control. By clocking the digital lines as fast as 10 MHz, you can use these lines for pulse-width modulation (PWM) to control valves, motors, fans, lamps, and pumps. With four waveform analog outputs, two 80 MHz counter/timers, and six DMA channels, M Series devices can execute multiple control loops simultaneously. High-speed M Series devices also have direct support for quadrature encoder measurements, protected digital lines, and digital debounce filters for control applications. With up to 80 analog inputs, 32 clocked digital lines, 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. With the NI SoftMotion Development Module for LabVIEW, you can create a complete custom motion controller with M Series devices.

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 high-speed 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, thus bridging the gap between test, control, and design applications.

M Series Performance on PCI Express

National Instruments was the first company to empower engineers and scientists to use the PCI Express and PXI Express buses for data acquisition. PCI Express M Series devices contain six DMA channels to maximize data throughput without using PC processing time. The PCI Express bus delivers the highest bandwidth compared to any other PC bus, and it eliminates throughput bottlenecks by providing 250 MB/s per-direction bandwidth across the x1 (“by one”) lane for increased data transfer. Each slot allocates dedicated bandwidth, meaning that multiple PCI Express boards do not share bandwidth for data transfer. With this improvement over the shared-bandwidth PCI

architecture, all onboard I/O runs simultaneously while data is transferred to and from PC memory across the bus. The PXI Express specifications integrate PCI Express signaling into the PXI Standard, which increases backplane bandwidth from 132 MB/s to 6 GB/s, a 45 times improvement. Both PCI Express and PXI Express facilitate a smooth transition to new hardware by providing complete backward compatibility to software written for applications that use PCI or PXI, respectively.

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.

M Series Performance on USB

With recent speed and bandwidth improvements, USB has evolved into a core bus of choice for measurement and automation applications. USB adds portability and ease of use with plug-and-play compatibility. With USB M Series, you can deliver a high-performance portable system using an available USB port on a laptop computer and other portable computing platforms. NI designed an innovative patent-pending signal streaming technology with which you can sustain four high-performance data streams over USB. This new technology greatly improves overall USB data acquisition performance by providing high-speed data paths for USB control and data transfer. USB M Series modules are available with built-in screw terminals, mass terminals, or OEM board-only versions.

High-Speed M Series Multifunction DAQ – 16-Bit, up to 1.25 MS/s, up to 80 Analog Inputs

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; programmable debounce filters remove glitches and spikes from switches and relays connected to digital input lines.

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.

R Series multifunction data acquisition devices contain an FPGA that is reconfigurable using the LabVIEW FPGA Module.

They 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.

Recommended Accessories

Signal conditioning is required for sensor measurements or voltage inputs greater than 10 V. NI 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. For applications that do not require signal conditioning, refer to Table 2 for recommended cabling and accessories.

Recommended Training

For new data acquisition programmers, NI recommends the “Data Acquisition: 7 Steps to Success Tutorial Kit.” This tutorial kit helps shorten development time for data acquisition applications by describing the various stages of getting started with data acquisition applications including system definition, setup, test, and application programming.

NI also offers instructor-led training and certification courses in cities worldwide. Visit ni.com/training for more information.

M Series	Feature	Connect to . . .	Connector ¹	Cable ²	Cable Adapter	Accessory ³
PCI, PXI, PCI Express, and PXI Express 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
USB devices	Custom connectivity	Unterminated	0 or 1	SHC68-NT-S	–	Custom-built or third-party
	Noise-reducing	SCC portable signal conditioning	0 or 1	SH68-68-EP	–	See ni.com/sigcon or SCC-68
	Noise-reducing	Screw terminals	0 or 1	SH68-68-EP	–	SCC-68, SCB-68, or TBX-68
	Noise-reducing	BNC terminal block	0 or 1	SH68-68-EP	–	BNC-2110, BNC-2111, BNC-2120, or BNC-2090
	Low-cost	Screw terminals	0 or 1	SH68-68-EP	–	CB-68LP or CB-68LPR

¹Connector 0 is found on all M Series devices. 0 and 1 require two cables and accessories and are available on NI 6254, NI 6255, and NI 6259 devices.

²For NI 6255, use SHC68-68-EPM on connector 0 and SHC68-68 on connector 1.

³For NI 6255 screw-terminal connectivity, use SCC-68 for connector 0 and SCB-68 for connector 1.

Table 2. Recommended Accessories

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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 obtain the latest version of NI-DAQmx, 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.

Ordering Information

USB

NI USB-6251	
Screw terminal	779627-0P ¹
Mass terminal	779694-0P ¹
OEM board-only kit	194929-03
OEM board-only kit (quantity 10)	779761-01
NI USB-6259	
Screw terminal	779628-0P ¹
Mass terminal	779695-0P ¹
OEM board-only kit	194929-01
OEM board-only kit (quantity 10)	779762-01

¹P is 1 (U.S. 120 VAC); 2 (Swiss 220 VAC); 3 (Australian 240 VAC); 4 (Universal Euro 240 VAC); 6 (UK 240 VAC); 7 (Japanese 100 VAC)

PCI

NI PCI-6250	779069-01
NI PCI-6251	779070-01
NI PCI-6254	779071-01
NI PCI-6255	779546-01
NI PCI-6259	779072-01

PXI

NI PXI-6250	779116-01
NI PXI-6251	779631-01
NI PXI-6254	779118-01
NI PXI-6255	779547-01
NI PXI-6259	779632-01

PXI (SCXI Control in PXI/SCXI Combination Chassis)

NI PXI-6251	779117-01
NI PXI-6259	779119-01

PCI Express

NI PCIe-6251	779512-01
NI PCIe-6259	779513-01

PXI Express

NI PXIe-6251	779777-01
NI PXIe-6259	779778-01

Data Acquisition Services

Data Acquisition: 7 Steps to Success	779489-01
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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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OEM Support

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We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit ni.com/ssp.

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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