Technical Sales
United States
(866) 531-6285
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Requirements and Compatibility | Ordering Information | Detailed Specifications
For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

Last Revised: 2009-08-10 11:42:19.0

NI ENET-9219

Ethernet 4-Channel Universal Input

- 10/100BASE-TX Ethernet port (100 Mbits/s)
- Up to 100 m cabling distance per segment
- Two digital PFI lines for triggering and sample clock import/export
- Includes LabVIEW SignalExpress LE data-logging software
- 11 measurement modes: temperature, resistance, voltage, current, and more
- Simultaneous sampling at up to 100 S/s/ch with 24-bit resolution
- Measure quarter-, half-, and full-bridge sensors with built-in excitation
- 250 Vrms channel-to-channel isolation

Overview

Simple, Complete, Ethernet Data Acquisition

Ethernet data acquisition is an extension of PC-based data acquisition to measurement applications distributed over a large area or network. NI Ethernet data acquisition (DAQ) devices combine industry-standard Ethernet communication; direct sensor connectivity; and the flexibility of NI-DAQmx driver software for remote monitoring of electrical, physical, mechanical, and acoustical signals. NI Ethernet DAQ devices can stream data on each channel at up to 250 kS/s. With the flexibility of NI-DAQmx and the ubiquity of Ethernet networking infrastructure, NI Ethernet DAQ makes it easy to incorporate remote connectivity into new or existing PC-based measurement or control systems.

The NI ENET-9219 Ethernet DAQ device includes four simultaneously sampled universal measurement channels for multipurpose testing. With the ENET-9219, you can measure several signals from sensors such as strain gages, RTDs, thermocouples, load cells, and other powered sensors. The channels are individually selectable, so you can perform a different measurement type on each of the four channels. Measurement ranges differ for each type of measurement and include up to ±60 V for voltage and ±25 mA for current. You can synchronize an ENET-9219 with other devices by using two onboard individually programmable digital trigger lines to export or import sample clocks, start triggers, pause triggers, and reference triggers.

With 250 Vrms of channel-to-channel isolation, the ENET-9219 protects both your measurement system and other channels within the same module from harmful voltage spikes. In addition to this increased safety, channel-to-channel isolation eliminates problems associated with ground loops and rejects high common-mode voltages for more accurate measurements.

Back to Top

Requirements and Compatibility

OS Information

- Windows 2000/XP
- Windows Vista x64/x86

Driver Information

- NI-DAQmx

Software Compatibility

- C#,Visual Basic,.NET
- ANSI C/C++
- LabVIEW
- LabVIEW SignalExpress
- LabWindows/CVI
- Measurement Studio

Back to Top

Application and Technology

NI ENET-9163 and C Series Hardware

Each NI ENET-9219 Ethernet universal input device is a combination of an NI ENET-9163 Ethernet carrier and an NI 9219 C Series measurement module. The ENET-9163 provides Ethernet connectivity back to a host PC. You can synchronize an ENET-9163 with other devices by using two onboard individually programmable digital trigger lines to export or import sample clocks, start triggers, pause triggers, and reference triggers.

C Series modules provide direct sensor connectivity and built-in signal conditioning for a variety of measurements, including temperature, strain, acceleration, current, and voltage. In addition to the ENET-9163, these modules may be used interchangeably for measurement and control applications with different chassis, including NI CompactDAQ and CompactRIO, and the NI USB-9162 and WLS-9163 carriers.

Figure 1. You can reuse the same NI C Series modules across multiple PC peripheral buses, from USB to Wi-Fi and Ethernet.

You can purchase ENET-9163 carriers and select C Series modules separately or together in a kit as ENET-9xxx devices. Visit **ni.com/crio/cseries** for a list of compatible devices.

TEDS Compatibility

IEEE 1451.4, also known as TEDS (transducer electronic data sheet), technology consists of a standardized set of templates for specific sensors that store information such as manufacturer, manufacture date, calibration data, sensor-specific setup data, and more. TEDS is typically implemented on the sensor side via an onboard EEPROM. With this, the sensor has all of the information needed for setup and calibration stored locally, so you no longer have to keep up with paper data sheets. On the instrumentation side, the measurement system must have the capability to read and understand the TEDS data from the sensor. The ENET-9219 has the capability to read TEDS information for TEDS-enabled sensors.

Recommended Software

NI Ethernet DAQ devices use the same NI-DAQmx API as hundreds of other NI PCI, PXI, and USB DAQ devices, so incorporating an NI Ethernet DAQ device into a new or existing measurement system is easy. 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 NI LabVIEW, LabVIEW SignalExpress, LabWindows™/CVI, and Measurement Studio software. To obtain the latest version of NI-DAQmx, visit **ni.com/support/daq/versions** . NI measurement services software speeds up your development with features including the following:

- A configuration-based interface to create fast and accurate measurements with no programming using the DAQ Assistant
- Automatic code generation to create your application in LabVIEW; LabWindows/CVI; LabVIEW SignalExpress; and C#, Visual Studio .NET, ANSI C/C++, or Visual Basic using Measurement Studio
- Multithreaded streaming technology for 1,000 times performance improvements
- More than 3,000 free software downloads that are available at **ni.com/zone** to jump-start your project
- A single programming interface for hundreds of PCI, PXI, USB, Ethernet, and Wi-Fi data acquisition hardware devices

NI Ethernet DAQ devices are compatible with the following versions (or later) of NI application software: LabVIEW 8.2, LabWindows/CVI 8.x, and Measurement Studio 8.x. They are also compatible with ANSI C/C++, C#, Visual Basic .NET, and Visual Basic 6.0.

Shipping Kit Contents

Every ENET-9219 shipping kit includes the following:

- ENET-9163 Ethernet C Series carrier
- NI 9219 universal input module
- 12 VDC power supply (region-specific power cord not included)
- Micro-fit plug and terminal kit (NI 9942)
- Rubber nonslip adhesive feet
- NI-DAQmx 9.0 (or later) software CDs for Windows Vista/XP/2000
- LabVIEW SignalExpress LE data-logging software
- *NI-DAQmx for the NI WLS/ENET-9163 Getting Started Guide*

Back to Top

Ordering Information

For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
Ethernet Universal Input Data Acquisition Device			
NI ENET-9219 4 Ch 100 S/s/ch, 24-Bit, ±60V, ±25mA Universal Input	780505-01	No accessories required.	
Region-Specific Power Cord (Required)			
U.S., 120 VAC	763000-01	No accessories required.	
Switzerland, 220 VAC	763065-01	No accessories required.	
Europe, 240 VAC	763067-01	No accessories required.	
Australia, 240 VAC	763066-01	No accessories required.	
UK, 240 VAC	763064-01	No accessories required.	
North America, 240 VAC	763068-01	No accessories required.	
Japan, 100 VAC	763634-01	No accessories required.	
Connectivity, Mounting, and Other Accessories (Optional)			
NI 9973 6-Position Spring Terminal Connector Block (qty 4)	196738-01	No accessories required.	
NI 9972 Backshell for 6-Position Connector Block (qty 4)	196720-01	No accessories required.	
2-Position Screw Terminal Kit for Power Supply Connection (qty 4)	780702-01	No accessories required.	
NI 9942 Trigger (PFI Line) Connector Kit	194611-01	No accessories required.	
DIN Rail Mounting Kit for DAQ and GPIB Devices	779689-01	No accessories required.	

Back to Top

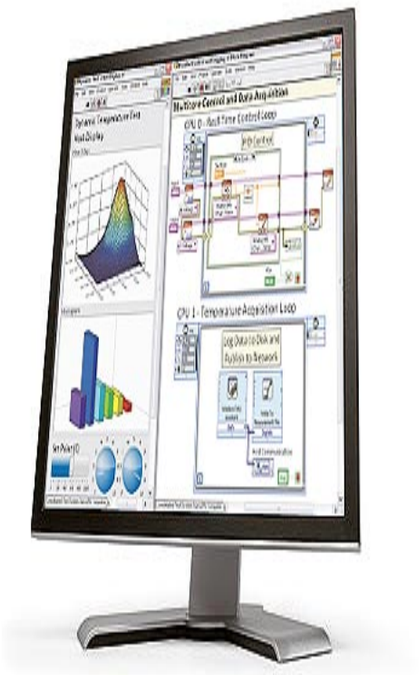
Software Recommendations

NI LabVIEW Professional Development System for Windows

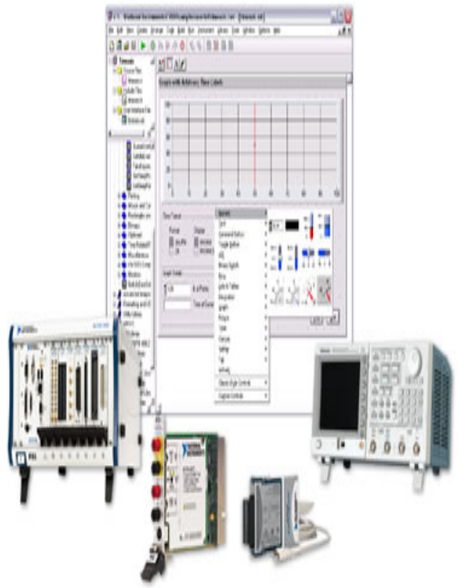
- Easy-to-use graphical development environment

NI LabWindows™/CVI for Windows

- Real-time advanced 2D graphs and charts with support for Windows

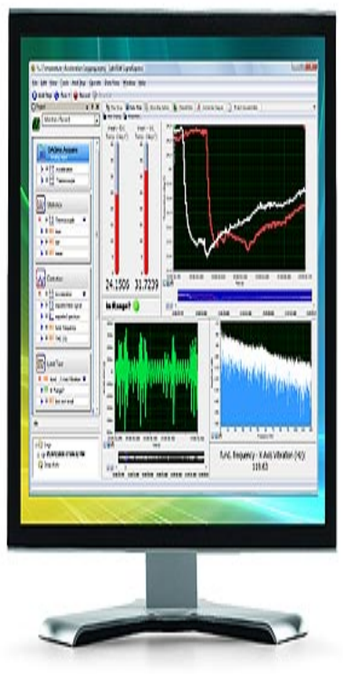


- Tight integration with a wide range of measurement hardware
- Rapid user interface development for displaying live data
- Extensive signal processing, analysis, and math functionality
- Source code control integration and code complexity metrics
- Support for Windows 2000/XP/Vista/7 (32-bit) and Windows Vista/7 (64-bit)



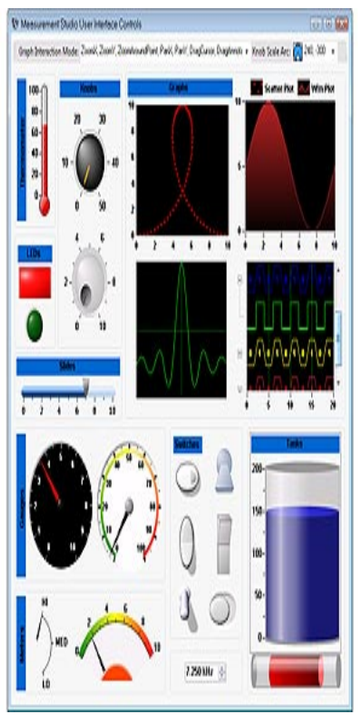
Vista/XP/2000
- Complete hardware compatibility with IVI, VISA, DAQ, GPIB, and serial
- Analysis tools for array manipulation, signal processing statistics, and curve fitting
- Simplified cross-platform communication with network variables
- Measurement Studio .NET tools (included in LabWindows/CVI Full only)
- The mark LabWindows is used under a license from Microsoft Corporation.

NI LabVIEW SignalExpress for Windows



- Quickly configure projects without programming
- Control over 400 PC-based and stand-alone instruments
- Log data from more than 250 data acquisition devices
- Perform basic signal processing, analysis, and file I/O
- Scale your application with automatic LabVIEW code generation
- Create custom reports or easily export data to LabVIEW, DIAdem or Microsoft Excel

NI Measurement Studio Professional Edition



- Base analysis and instrumentation components for Microsoft Visual Basic, Visual C#, and Visual C++
- Cross-platform communication with network variables
- Scientific user interface controls
- Code-generating DAQ Assistant and Instrument I/O Assistant
- Acquire data from GPIB, serial, Ethernet, and plug-in data acquisition devices
- Requires Microsoft Visual Studio 2008/2005/.NET 2003 or Visual Studio 6.0

Back to Top

Support and Services

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. NI offers a number of calibration services to help maintain the ongoing accuracy of your measurement hardware. These services allow you to be completely confident in your measurements, and help you maintain compliance to standards like ISO 9001, ANSI/NCSL Z540-1 and ISO/IEC 17025. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

Back to Top

Detailed Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted.

ENET-9219 Input Characteristics	
Number of channels	4 analog input channels
ADC resolution	24 bits
Type of ADC	Delta-sigma (with analog prefiltering)
Sampling mode	Simultaneous
Type of TEDS supported	IEEE 1451.4 TEDS Class II (Interface)

Mode input ranges		
Mode	Nominal Range(s)	Actual Range(s)
Voltage	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV
Current	±25 mA	±25 mA
4-Wire and 2-Wire Resistance	10 kΩ, 1 kΩ	10.5 kΩ, 1.05 kΩ
Thermocouple	±125 mV	±125 mV
4-Wire and 3-Wire RTD	Pt 1000, Pt 100	5.05 kΩ, 505 Ω
Quarter-Bridge	350 Ω, 120 Ω	390 Ω, 150 Ω
Half-Bridge	±500 mV/V	±500 mV/V
Full-Bridge	±62.5 mV/V, ±7.8 mV/V	±62.5 mV/V, ±7.8125 mV/V
Digital In	—	0–60 V
Open Contact	—	1.05 kΩ

Conversion time, no channels in TC mode	
High speed	10 ms for all channels
Best 60 Hz rejection	110 ms for all channels
Best 50 Hz rejection	130 ms for all channels
High resolution	500 ms for all channels
Conversion time, one or more channels in TC mode	
High speed	20 ms for all channels
Best 60 Hz rejection	120 ms for all channels
Best 50 Hz rejection	140 ms for all channels
High resolution	510 ms for all channels
Overvoltage protection	
Terminals 1 and 2	±30 V
Terminals 3 through 6, across any combination	±60 V
Input impedance	
Voltage and Digital In modes (±60 V, ±15 V, ±4 V)	1 MΩ
Current mode	<40 Ω
All other modes	>1 GΩ

Accuracy		
Mode, Range	Gain Error (Percent of Reading)	Offset Error (ppm of Range)
	Typ (25 °C, ±5 °C), Max (–40 to 70 °C)	
Voltage, ±60 V	±0.3, ±0.4	±20, ±50
Voltage, ±15 V	±0.3, ±0.4	±60, ±180
Voltage, ±4 V	±0.3, ±0.4	±240, ±720
Voltage, ±1 V	±0.1, ±0.18	±15, ±45
Voltage/Thermocouple, ±125 mV	±0.1, ±0.18	±120, ±360
Current, ±25 mA	±0.1, ±0.6	±30, ±100
4-Wire and 2-Wire [1] Resistance, 10 kΩ	±0.1, ±0.5	±120, ±320
4-Wire and 2-Wire [1] Resistance, 1 kΩ	±0.1, ±0.5	±1200, ±3200
4-Wire and 3-Wire RTD, Pt 1000	±0.1, ±0.5	±240, ±640
4-Wire and 3-Wire RTD, Pt 100	±0.1, ±0.5	±2400, ±6400
Quarter-Bridge, 350 Ω	±0.1, ±0.5	±2400, ±6400
Quarter-Bridge, 120 Ω	±0.1, ±0.5	±2400, ±6400
Half-Bridge, ±500 mV/V	±0.03, ±0.07	±300, ±450
Full-Bridge, ±62.5 mV/V	±0.03, ±0.08	±300, ±1000
Full-Bridge, ±7.8 mV/V	±0.03, ±0.08	±2200, ±8000

Cold-junction compensation sensor accuracy	±1°C typ

Stability		
Mode, Range	Gain Drift (ppm of Read-ing/°C)	Offset Drift (ppm of Range/°C)
Voltage, ±60 V	±20	±0.2
Voltage, ±15 V	±20	±0.8
Voltage, ±4 V	±20	±3.2
Voltage, ±1 V	±10	±0.2
Voltage/Thermocouple, ±125 mV	±10	±1.6
Current, ±25 mA	±15	±0.4
4-Wire and 2-Wire Resistance, 10 kΩ	±15	±3
4-Wire and 2-Wire Resistance, 1 kΩ	±15	±30
4-Wire and 3-Wire RTD, Pt 1000	±15	±6
4-Wire and 3-Wire RTD, Pt 100	±15	±60
Quarter-Bridge, 350 Ω	±15	±120
Quarter-Bridge, 120 Ω	±15	±240
Half-Bridge, ±500 mV/V	±3	±20
Full-Bridge, ±62.5 mV/V	±3	±20
Full-Bridge, ±7.8 mV/V	±3	±20

Input noise in ppm of Range$_{rms}$				
Mode, Range	Conversion Time			
	High speed	Best 60 Hz re-jection	Best 50 Hz re-jection	High resolution
Voltage, ±60 V	7.6	1.3	1.3	0.5
Voltage, ±15 V	10.8	1.9	1.9	0.7
Voltage, ±4 V	10.8	2.7	2.7	1.3
Voltage, ±1 V	7.6	1.3	1.3	0.5
Voltage/Thermocouple, ±125 mV	10.8	1.9	1.9	1.0
Current, ±25 mA	10.8	1.9	1.9	1.0
4-Wire and 2-Wire Resistance, 10 kΩ	4.1	1.3	0.8	0.3
4-Wire and 2-Wire Resistance, 1 kΩ	7.1	1.8	1.2	0.7
4-Wire and 3-Wire RTD, Pt 1000	7.6	1.7	1.1	0.4
4-Wire and 3-Wire RTD, Pt 100	10.8	1.9	1.9	0.9
Quarter-Bridge, 350 Ω	5.4	1.0	1.0	0.7
Quarter-Bridge, 120 Ω	5.4	1.0	1.0	0.7
Half-Bridge, ±500 mV/V	3.8	0.5	0.5	0.2
Full-Bridge, ±62.5 mV/V	5.4	1.0	1.0	0.8
Full-Bridge, ±7.8 mV/V	30	4.7	4.7	2.3

Input bias current	<1 nA
INL	±15 ppm
CMRR (f_{in} = 60 Hz)	>100 dB
NMRR	
Best 60 Hz rejection	90 dB at 60 Hz
Best 50 Hz rejection	80 dB at 50 Hz
High resolution	65 dB at 50 Hz and 60 Hz

Excitation level for Half-Bridge and Full-Bridge modes		
Mode	Load Resistance (Ω)	Excitation (V)
Half-Bridge	700	2.5
	240	2.0
Full-Bridge	350	2.7
	120	2.2

Excitation level for Resistance, RTD, and Quarter-Bridge modes	
Load Resistance (Ω)	Excitation (mV)
120	50
350	150
1 k	430
10 k	2200

MTBF	384,716 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

ENET-9219 Power Requirements

Power consumption from chassis

Active mode	750 mW max
Sleep mode	25 µW max

Thermal dissipation (at 70 °C)

Active mode	625 mW max
Sleep mode	25 µW max

ENET-9219 Physical Characteristics

Note For two-dimensional drawings and three-dimensional models of the C Series module and connectors, visit ni.com/dimensions and search by module number.

Spring-terminal wiring	18 to 28 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end
Weight	156 g (5.5 oz)

ENET-9219 Safety

If you need to clean the module, wipe it with a dry towel.

Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-channel

Continuous	250 VAC, Measurement Category II
Withstand	1,390 VAC, verified by a 5 s dielectric withstand test

Channel-to-earth ground

Continuous	250 VAC, Measurement Category II
Withstand	2,300 VAC, verified by a 5 s dielectric withstand test

Zone 2 hazardous locations applications in Europe channel-to-channel and channel-to-earth ground	60 VDC, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

Caution Do *not* connect to signals or use for measurements within Measurement Categories II, III, or IV.

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (e.g., 115 V for U.S. or 230 V for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar products.

Caution Do *not* connect to signals or use for measurements within Measurement Categories III or IV.

Hazardous Locations	
U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nA IIC T4
Europe (DEMKO)	Ex nA IIC T4

Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:
• IEC 61010-1, EN 61010-1
• UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the
Online Product Certification
section.

ENET-9219 Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:
• EN 61326 (IEC 61326): Class A emissions; Industrial Immunity
• EN 55011 (CISPR 11): Group 1, Class A emissions
• AS/NZS CISPR 11: Group 1, Class A emissions
• FCC 47 CFR Part 15B: Class A emissions
• ICES-001: Class A emissions

Note For the standards applied to assess the EMC of this product, refer to the
Online Product Certification
section.

Note For EMC compliance, operate this device with shielded cables.

ENET-9219 CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:
• 2006/95/EC; Low-Voltage Directive (safety)
• 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note For the standards applied to assess the EMC of this product, refer to the
Online Product Certification
section.

ENET-9219 Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification , search by module number or product line, and click the appropriate link in the Certification column.

ENET-9219 Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration	
Random (IEC 60068-2-64)	5 g_{rms}, 10 to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 to 500 Hz
Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine, 50 g, 3 ms half sine, 18 shocks at 6 orientations

ENET-9219 Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	–40 to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	–40 to 85 °C
Ingress protection	IP 40
Operating humidity (IEC 60068-2-56)	10 to 90% RH, noncondensing
Storage humidity (IEC 60068-2-56)	5 to 95% RH, noncondensing
Maximum altitude	2,000 m
Pollution Degree (IEC 60664)	2

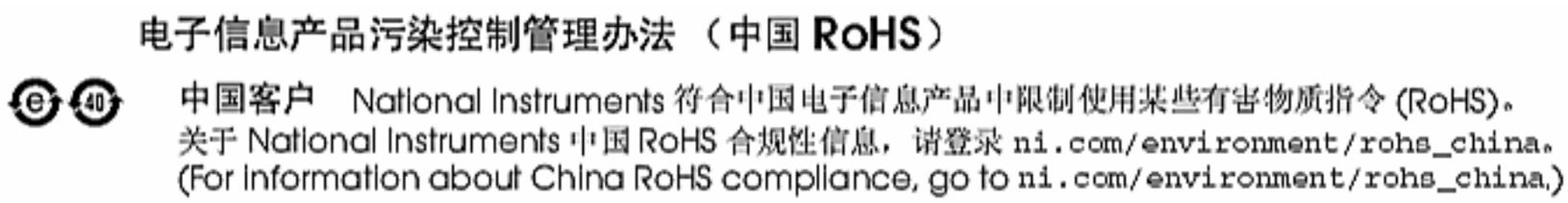
ENET-9219 Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the
NI and the Environment
Web page at ni.com/environment . This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm .



ENET-9219 Calibration

You can obtain the calibration certificate for this device at ni.com/calibration .

Calibration interval	1 year

2-Wire Resistance mode accuracy depends on the lead wire resistance. This table assumes 0 Ω of lead wire resistance.

MAINS is defined as the (hazardous live) electrical supply system to which equipment is designed to be connected for the purpose of powering the equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

NI WLS/ENET-9163 Carrier Specifications

These specifications are typical at 25 °C unless otherwise noted.

For C Series I/O module specifications, refer to the documentation included with the modules.

Note These specifications are for the NI WLS/ENET-9163 carrier only, unless otherwise noted.

WLS/ENET-9163 Analog Input	
Input FIFO size	4095 samples >16 bit, 8191 samples ≤16 bit
Sample rate	
NI WLS/ENET-9163 carrier	5 MS/s (multi-channel, aggregate), maximum
With NI WLS/ENET-9215	100 kS/s, maximum
Timing accuracy [2]	50 ppm of sample rate
Timing resolution [2]	50 ns
Number of channels supported	Determined by the C Series I/O module

WLS/ENET-9163 Digital Triggers	
Static Characteristics	
Number of terminals	2 bi-directional, individually settable
Pull-down resistor	49.9 kΩ ±0.5%
Input voltage protection	±20 V on each pin
Power-on state	Input
Required minimum input pulse width	100 ns
PFI Functionality	
PFI 1	Sample Clock In, Sample Clock Out
PFI 0	Start Trigger In, Start Trigger Out, Pause In, Reference Trigger In

Maximum Operation Conditions		
Level	Min	Max
I_{OL} output low current	—	8 mA
I_{OH} output high current	—	–8 mA

Digital Input Characteristics		
Level	Min	Max
V_{IL} input low voltage V_{IH} input high voltage	0 V 2 V	0.8 V 5 V
I_{IL} input low current (V_{in} = 0 V) I_{IH} input high current (V_{in} = 5 V)	— —	–15 µA 120 µA

Digital Output Characteristics		
Parameter	Voltage Level	Current Level
V_{OL}	0.5 V	6 mA
V_{OH}	4.0 V	–6 mA

WLS/ENET-9163 Wireless (NI WLS-9163 Carrier Only)

Radio mode	IEEE 802.11b, 802.11g
Wireless mode	Ad-Hoc and Infrastructure
Frequency range	2.412–2.462 GHz
Channel	1–14
Security	WEP-40, WEP-104, WPA, WPA2
EAP Type	LEAP, PEAP , TTLS , TLS
Center frequency	
11b	2412–2484 MHz
11g	2412–2472 MHz
Channel interval	
11b	5 MHz
11g	5 MHz
Modulation type	
11g	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)
11b	DSSS (CCK, DQPSK, DBPSK)

TX power		
Specification	Channel	Maximum Radio Output
11g	1	12 dBm
	2	16 dBm
	3, 4	15.5 dBm
	5–7	15 dBm
	8–10	14.5 dBm
	11–13	14 dBm
11b	1–14	16 dBm

WLS/ENET-9163 Receiver Sensitivity	
11b, FER<8%	
11 Mbps	–82 dB/min
5.5 Mbps	–84 dB/min
2 Mbps	–86 dB/min
1 Mbps	–88 dB/min
11g, PER<10%	
54 Mbps	–68 dB/min
48 Mbps	–68 dB/min
36 Mbps	–75 dB/min
24 Mbps	–79 dB/min
18 Mbps	–82 dB/min
12 Mbps	–84 dB/min
9 Mbps	–87 dB/min
6 Mbps	–88 dB/min

Antenna (NI WLS-9163 Carrier Only)	
Connector	Female RP-SMA connector

Electrical performance	
Property	Performance
VSWR	Max. 2.0 (2.4–2.5 GHz)
Impedance	50 Ω nominal
Directivity	Omni
Max. gain	2.0 dBi (2.4–2.5 GHz)

WLS/ENET-9163 Ethernet

Network interface	100 Base-TX, full-duplex; 100 Base-TX, half-duplex; 10 Base-T, full-duplex; 10 Base-T, half-duplex
Network protocols	TCP/IP, UDP
Network ports used	HTTP:80 (configuration only), HTTPS:43 (configuration only), TCP:31415, UDP:44515
Network IP configuration	DHCP + Link–Local, DHCP, Static, Link–Local
Communication rates	10/100 Mbps, auto-negotiated
Maximum cabling distance	100 m/segment

WLS/ENET-9163 Module I/O States

At power-on	Module-dependent. Refer to the documentation included with the C Series I/O module.

WLS/ENET-9163 Power Requirements

Caution You must use a National Electric Code (NEC) UL Listed Class 2 power supply with NI WLS/ENET-9000 Series devices.

Note Some C Series I/O modules have additional power requirements. For more information about the C Series I/O module power requirements, refer to the documentation included with the C Series I/O module.

Input voltage range	9 V to 30 V
Maximum required input power	4.5 W
Power input mating connector	2 position combicon, Phoenix Contact part number: 1714977

WLS/ENET-9163 Physical Characteristics

Weight	Approx. 242 g (8.5 oz)
Weight with antenna (NI WLS-9163 Only)	Approx. 256 g (9 oz)
Dimensions	182 mm × 95 mm × 37 mm (7.18 in. × 3.75 in. × 1.50 in.)
With rubber feet attached	+3.56 mm (+0.140 in.)

WLS/ENET-9163 Antenna

Antenna connector (antenna not attached)	+5.71 mm (+0.225 in.)
Attached, fully extended	+108.7 mm (+4.28 in.)

Note Refer to the
Dimensions
section for device dimensions with the antenna attached.

WLS/ENET-9163 Safety

If you need to clean the carrier, wipe it with a dry towel.

Safety Standards

The NI WLS/ENET-9163 carrier is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:
• IEC 61010-1, EN 61010-1
• UL 61010-1, CSA 61010-1
• EN 50371

Note For UL and other safety certifications, refer to the product label, or go to ni.com/certification , search by model number or product line, and click the appropriate link in the Certification column.

Safety Voltages

Connect only voltages that are within these limits.

V terminal to C terminal	30 V max, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

Caution Do not connect the system to signals or use for measurements within Measurement Categories II, III, or IV.

RF Safety Warning (NI WLS-9163 Carrier Only)

This equipment complies with FCC radiation exposure limits set for uncontrolled equipment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This product generates and radiates radio frequency energy. To comply with the radio frequency radiation exposure guidelines in an uncontrolled environment, this equipment should be installed and operated with at least 20 cm and more between the radiator and the person’s body (excluding extremities: hands, wrists, feet, and legs).

WLS/ENET-9163 Environmental

The NI WLS/ENET-9163 carrier is intended for indoor use only. For outdoor use, mount the system in a suitably rated enclosure.

Operating temperature (IEC-60068-2-1 and IEC-60068-2-2)	0 to 55 °C
Storage temperature (IEC-60068-2-1 and IEC-60068-2-2)	– 10 to 70 °C
Ingress protection	IP 30
Operating humidity (IEC-60068-2-56)	10 to 90% RH, noncondensing
Storage humidity (IEC-60068-2-56)	5 to 90% RH, noncondensing
Maximum altitude	2,000 m
Pollution Degree (IEC 60664)	2

WLS/ENET-9163 Shock and Vibration

To meet these specifications, you must panel mount the NI WLS/ENET-9163 carrier and affix ferrules to the ends of the terminal lines.

Operational shock	30 g peak, half-sine, 11 ms pulse (Tested in

	accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)
Random vibration	

Operating	5 to 500 Hz, 0.3 g_{rms}
Nonoperating	5 to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

WLS/ENET-9163 Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A
- EN 301489-01 [9] , EN 301489-17 [9]
- FCC 15-247 [9] , IC RSS-210 [9] , EN 300328 [9]

Note For EMC compliance, operate this device according to product documentation. For country-specific restrictions, go to ni.com/certification , search by model number or product line, and click the appropriate link in the Certification column

Electronic Compatibility Information

This hardware has been tested and found to comply with the applicable regulatory requirements and limits for electromagnetic compatibility (EMC) as indicated in the hardware's Declaration of Conformity (DoC). These requirements and limits are designed to provide reasonable protection against harmful interference when the hardware is operated in the indicated electromagnetic environment. In special cases, for example when either highly sensitive or noisy hardware is being used in close proximity, additional mitigation measures may have to be employed to minimize the potential for electromagnetic interference.

While this hardware is compliant with the applicable regulatory EMC requirements, there is no guarantee that interference will not occur in a particular installation. To minimize the potential for the hardware to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this hardware in strict accordance with the instructions in the hardware documentation and the DoC.

If this hardware does cause interference with licensed radio communications services or other nearby electronic hardware, which can be determined by turning the hardware off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver (the device suffering interference).
- Relocate the transmitter (the device generating interference) with respect to the receiver.
- Plug the transmitter into a different outlet so that the transmitter and the receiver are on different branch circuits.

This hardware may generate emissions that exceed regulatory requirements or may become more sensitive to disturbances in the local electromagnetic environment when test leads are attached or when connected to a test object.

Operation of this hardware in a residential area is likely to cause harmful interference. Users are required to correct the interference at their own expense or cease operation of the hardware.

Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the hardware under the local regulatory rules.

WLS/ENET-9163 CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility (EMC) Directive
- 1999/5/EC
  ; Radio and Telecommunications Terminal Equipment (R&TTE) Directive

EU Regulatory Statements

cs Česky [Czech]	*[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
da Dansk [Danish]	Undertegnede *[fabrikantens navn]* erklærer herved, at følgende udstyr *[udstyrets typebetegnelse]* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
de Deutsch [German]	Hiermit erklärt *[Name des Herstellers]*, dass sich das Gerät *[Gerätetyp]* in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
et Eesti [Estonian]	Käesolevaga kinnitab *[tootja nimi = name of manufacturer]* seadme *[seadme tüüp = type of equipment]* vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
en English	Hereby, *[name of manufacturer]*, declares that this *[type of equipment]* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
es Español [Spanish]	Por medio de la presente *[nombre del fabricante]* declara que el *[clase de equipo]* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
el Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ *[name of manufacturer]* ΔΗΛΩΝΕΙ ΟΤΙ *[type of equipment]* ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
fr Français [French]	Par la présente *[nom du fabricant]* déclare que l'appareil *[type d'appareil]* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
it Italiano [Italian]	Con la presente *[nome del costruttore]* dichiara che questo *[tipo di apparecchio]* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
lv Latviski [Latvian]	Ar šo *[name of manufacturer / izgatavotāja nosaukums]* deklarē, ka *[type of equipment / iekārtas tips]* atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
lt Lietuvių [Lithuanian]	Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
nl Nederlands [Dutch]	Hierbij verklaart *[naam van de fabrikant]* dat het toestel *[type van toestel]* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
mt Malti [Maltese]	Hawnhekk, *[isem tal-manifattur]*, jiddikjara li dan *[il-mudel tal-prodott]* jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
hu Magyar [Hungarian]	Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
pl Polski [Polish]	Niniejszym *[nazwa producenta]* oświadcza, że *[nazwa wyrobu]* jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
pt Português [Portuguese]	*[Nome do fabricante]* declara que este *[tipo de equipamento]* está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
sl Slovensko [Slovenian]	*[Ime proizvajalca]* izjavlja, da je ta *[tip opreme]* v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
sk Slovensky [Slovak]	*[Meno výrobcu]* týmto vyhlasuje, že *[typ zariadenia]* spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
fi Suomi [Finnish]	*[Valmistaja = manufacturer]* vakuuttaa täten että *[type of equipment = laitteen tyyppimerkintä]* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
sv Svenska [Swedish]	Härmed intygar *[företag]* att denna *[utrustningstyp]* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Íslenska [Icelandic]	Hér með lýsir *[name of manufacturer]* yfir því að *[type of equipment]* er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
no Norsk [Norwegian]	*[Produsentens navn]* erklærer herved at utstyret *[utstyrets typebetegnelse]* er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ni.com/ certification , search by model number or product line, and click the appropriate link in the Certification column.

WLS/ENET-9163 Environmental Management

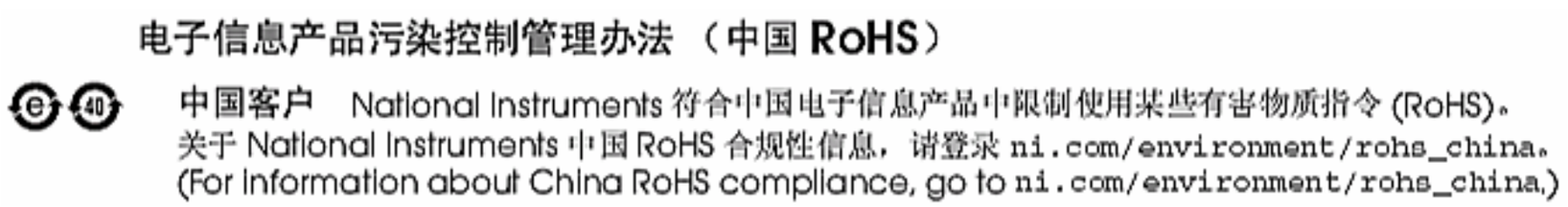
National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating

certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the
NI and the Environment
Web page at ni.com/environment . This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm .



Performance dependent on type of installed C Series I/O modules and number of channels in the task.

Does not include group delay. Refer to C Series I/O module documentation for more information.

Stresses beyond those listed under
Input voltage protection
may cause permanent damage to the device.

Module-dependent.

Due to regulations, the valid channels depend upon in which country the device is operating.

Only PEAPv0/MS-CHAPv2 is supported.

Only CHAP and MS-CHAPv2 are supported.

NI WLS-9163 carrier only.

NI WLS-9163 carrier only.

NI WLS-9163 only.

Back to Top