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Wireless Sensor Network Ethernet Gateway

NI WSN-9791



CONTROL ENGINEERING
2010
ENGINEERS' CHOICE AWARDS

- Support for hundreds of nodes to help you create a reliable network to monitor your assets or environment
- NI-WSN software provides easy network configuration, drag-and-drop LabVIEW programming, and support for logging, alarming, and Web-based data visualization
- 2.4 GHz, IEEE 802.15.4 radio to communicate with distributed WSN measurement nodes and 10/100 Mbit/s Ethernet port for flexible connectivity to Windows or LabVIEW Real-Time host controllers, where you can process and visualize data
- Up to 300 m outdoor range with line of sight
- Each gateway supports up to 36 measurement nodes in a mesh configuration
- Support for 14 gateways in the same location, using noncompeting wireless channels
- 9 to 30 VDC power input
- Panel and DIN-rail mounting options available
- Industrial ratings: 30 to 70 ºC operating temperature and 50 g shock, 5 g vibration

Overview

The National Instruments wireless sensor network (WSN) platform delivers low-power measurement nodes that offer industrial certifications, reliable networking, and optional weatherproof outdoor enclosures for long-term, remote monitoring applications.

The NI WSN-9791 Ethernet gateway coordinates communication between distributed WSN measurement nodes by managing network traffic and aggregating measurement data. The Ethernet gateway must be connected to a host controller running NI LabVIEW software, so you can process, analyze, and visualize your measurement data. This host controller could be a Windows PC or LabVIEW Real-Time target such as NI CompactRIO or PXI hardware.

With graphical LabVIEW software, you can easily configure your network, collect measurement data, trigger alarms through SMS or e-mail, and even view monitoring data within a Web browser. With the LabVIEW Wireless Sensor Network (WSN) Module, you can customize the behavior of programmable NI WSN measurement nodes. Use this module to optimize node behavior for your application: customize sample and transmission rates, perform onboard analysis or data reduction, respond to digital value changes, perform local control of DIO lines, and even store data to flash memory.

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Requirements and Compatibility

OS Information

Windows 2000/XP
Windows 7
Windows Vista

Software Compatibility

LabVIEW
LabVIEW Real-Time Module

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Application and Technology

System and Network Architectures

NI wireless sensor networks (WSNs) are ideally suited for long-term remote monitoring applications that focus on subjects such as the environment, water quality, structural health, energy quality and consumption, transportation, and machine condition. NI WSN measurement nodes can withstand outdoor and industrial environments and reliably monitor assets or surroundings to provide enhanced visibility into the overall health of your systems or processes.

The NI wireless sensor network system is built on a low-power, reliable IEEE 802.15.4 network. The WSN-9791 Ethernet gateway coordinates the wireless network, performing functions such as device authentication, message buffering, and network topology administration. The gateway wirelessly collects measurement data and features a 10/100 Mbit/s Ethernet port to provide flexible connectivity to a Windows or LabVIEW Real-Time target, as seen in Figure 1. Unlike the NI 9792 programmable WSN gateway, the WSN-9791 must be connected to a host controller running LabVIEW.

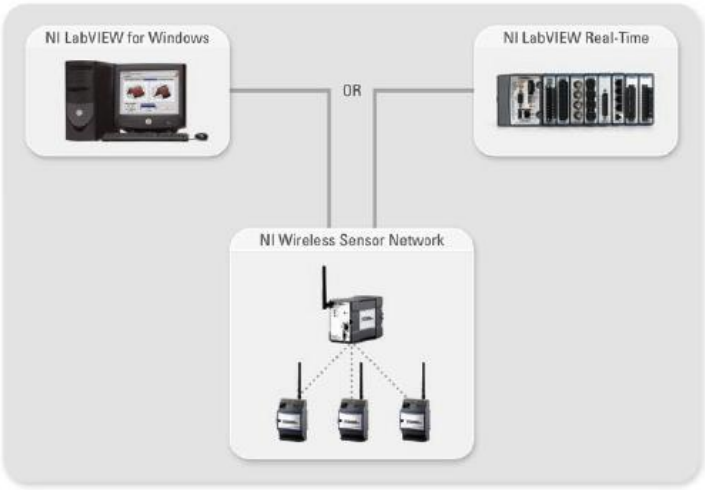


Figure 1. NI WSN systems provide flexible connectivity to Windows or LabVIEW Real-Time host controllers.

The 9 to 30 VDC externally powered gateway offers -30 to 70 °C operating temperatures, 50 g shock ratings, and a compact, 2U form factor. You can configure the Ethernet settings of the gateway for DHCP, static, and link-local IP address configurations. Up to 36 measurement nodes can communicate with a single gateway, and each gateway can operate on any of 14 wireless communication channels to increase network size and ensure coexistence with other wireless devices. This allows a full WSN system to scale to over 2,000 analog channels (14 gateways X 36 nodes per gateway X 4 analog channels per node).

The gateway, routers, and end nodes work together to form a mesh network. Measurement nodes can operate as routers or end nodes, providing the flexibility to extend the range of your sensor network. When nodes are configured as routers, they can repeat messages from end nodes and extend network range while acquiring measurement data.

The NI WSN platform can function as a simple, stand-alone wireless monitoring system, or be combined with other hardware components to achieve a complete wired and wireless measurement and control system, as shown in Figure 2. Through LabVIEW, you can combine NI wireless sensor network devices with other NI platforms to customize and enhance your measurement capabilities. You can complement your NI WSN with embedded NI CompactRIO systems, vision systems, or even human machine interfaces (HMIs) to create a fully integrated solution that meets the unique needs of your application.

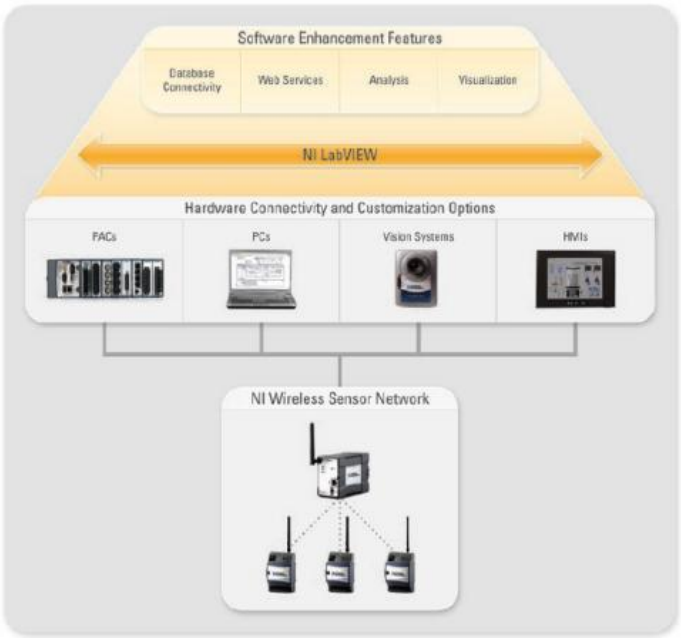


Figure 2. NI WSN systems provide flexible connectivity to Windows or LabVIEW Real-Time host controllers.

Software Overview

With NI-WSN software, you can easily configure your sensor network and quickly extract measurement data from your wireless sensor network with the LabVIEW graphical development environment.

NI WSN measurement nodes configured with a gateway are automatically added to your LabVIEW project, giving you instant access to their I/O and properties. Simply drag and drop I/O variables from a LabVIEW project to a LabVIEW block diagram for data extraction, analysis, and presentation. Using the drag-and-drop LabVIEW variables, you can monitor the analog and digital channels as well as other node attributes such as link quality, battery voltage, and whether a node is configured as a router or end node. Because of these properties, you can intelligently maintain your network and choose the best locations for your measurement nodes. The LabVIEW project interface also offers access to node property configuration utilities. You can modify node sample intervals, define the analog and digital channel parameters, and provide aliases.

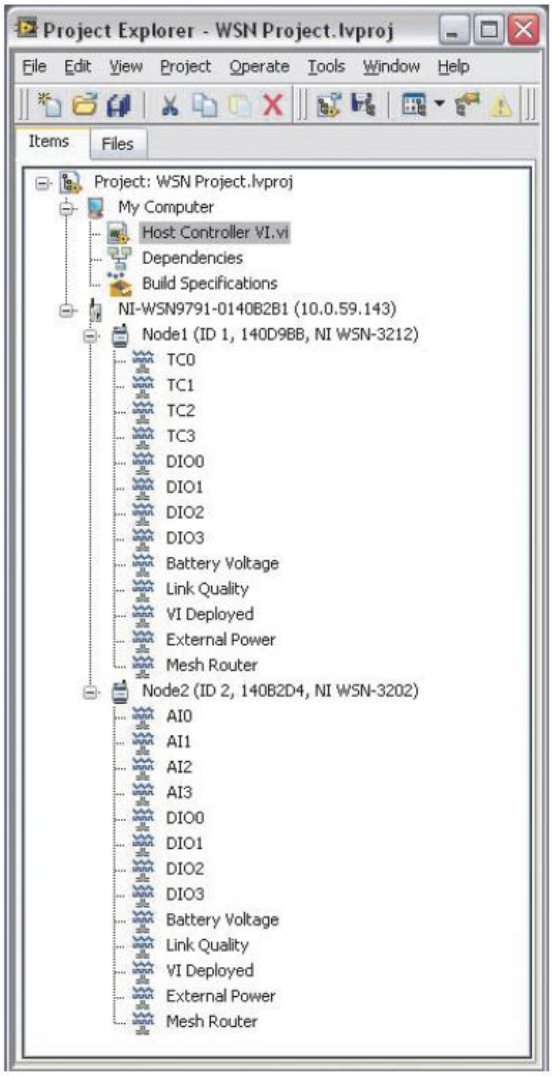


Figure 3. NI WSN System in a LabVIEW Project

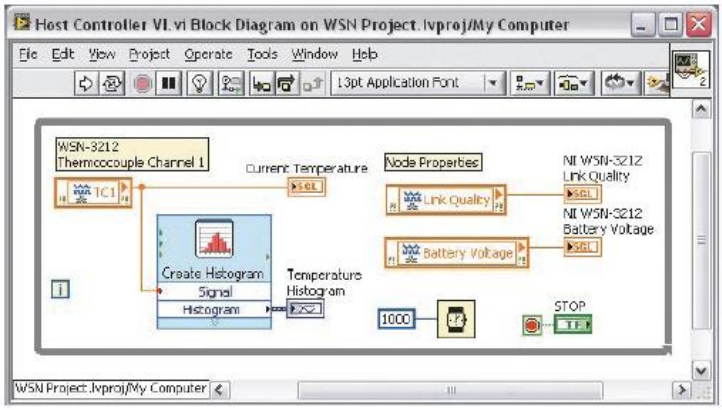


Figure 4. Extracting NI WSN Measurement Data Using LabVIEW

LabVIEW delivers a common development environment for all of your monitoring and control applications as well as rapid programming, easy network configuration, and open connectivity to a variety of third-party instruments and systems. And with a multitude of LabVIEW add-ons, you can visualize data in a Web browser, conduct advanced data processing and analysis, or perform integrated event detection and alarming

Node Programming (LabVIEW WSN)

NI recommends the programmable versions of both nodes and gateways. You can customize the behavior of programmable NI WSN measurement nodes with the LabVIEW WSN Module. Use this module to perform custom analysis, extend battery life, and embed local decision making on NI WSN measurement nodes.

With the LabVIEW WSN Module, you can significantly increase the battery life of your NI WSN measurement nodes while increasing performance and flexibility. By default, a node transmits every acquired value back to the gateway at the specified sample interval; however, in many applications, it is sufficient to simply monitor a given input for a threshold crossing or average values over a

period of time. In these applications, powering the radio to transmit every acquired sample uses excessive power and reduces battery life. With LabVIEW WSN, you can add intelligence to the node to transmit data only when required. Additionally, you can monitor battery voltage and network status as well as modify the sample interval of the node to optimize behavior for specific operating conditions.

This also helps you achieve higher sample rates by customizing how the node acquires and transmits data. Exact sample rates depend on how many channels you are sampling, the analysis performed on each sample, and how many samples are transmitted back to the host, but programmable WSN nodes can achieve faster sample rates than those noted in the specifications. Refer to the LabVIEW WSN benchmarks white paper on NI Developer Zone for more information on increasing sample rates.

Using a subset of LabVIEW analysis functions and floating-point math operations, you can preprocess data acquired by NI WSN measurement nodes. A variety of analog and digital sensors can interface directly with these nodes, and you can use LabVIEW WSN to scale and convert raw sensor data into meaningful engineering units before transmitting.

With LabVIEW WSN, you can also embed intelligence on NI WSN measurement nodes, so decisions can be made autonomously without transmitting the stimulus and response to and from a host computer or embedded controller. You can use the digital output lines on an NI WSN measurement node to actuate relays and perform simple on/off control. For example, a programmed node can turn on a fan when a temperature threshold is exceeded, which reduces response time and increases reliability by removing the need for host interaction.

Mechanical Information

The WSN-9791 Ethernet gateway measures approximately 4.6 by 2.3 by 3.5 in. (L by W by H). The front of the gateway offers power, status, and activity LEDs in addition to a reset button that you can use to reboot the device. The power connector and Ethernet port are located on the front, while the DIN-rail and panel mount plate screw holes are located on the back of the device. The gateway also includes integrated panel mount holes that are located on the side of the device. Consult the WSN-9791 user guide for detailed mechanical information.

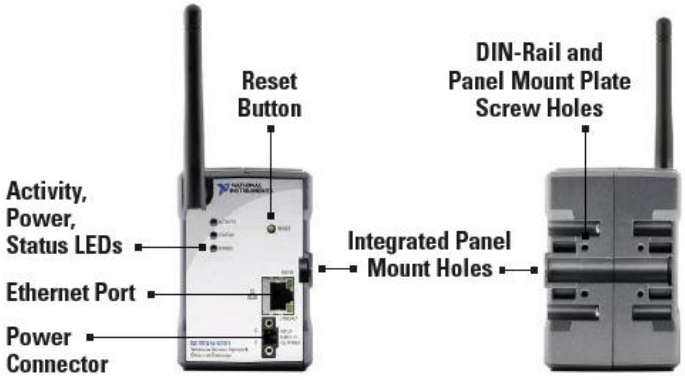


Figure 5. Gateway External Features

Accessories

NI WSN accessories feature options for gateway and measurement node mounting as well as a weatherproof enclosure for outdoor use of the measurement nodes and gateways. The NI WSN-3294 is an outdoor, weatherproof enclosure for the WSN-9791 Ethernet gateway. The enclosure features two I/O glands for routing power and Ethernet cables and is shipped with four I/O gland inserts and two I/O gland plugs so you can customize the glands for your application. The WSN-3294 offers an IP65 (Ingress Protection) rating to protect the gateway for long-term, outdoor deployment.

Please view the WSN accessories data sheet for a complete list of WSN mounting accessories, outdoor enclosures, backshell kits, and power supplies.

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Ordering Information

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

Products	Part Number	Recommended Accessories	Part Number
Starter Kits			
NI WSN Starter Kit (Americas)	781080-01	No accessories required.	
NI WSN Starter Kit (Europe/Asia)	781080-11	No accessories required.	
Outdoor Enclosures			
NI WSN-3294 Ethernet Gateway Enclosure	199975-01	No accessories required.	
NI WSN-3291 Measurement Node Enclosure	780994-01	No accessories required.	
Programmable Measurement Nodes			
NI WSN-3231 RS-485 Serial Node (Europe/Asia)	781977-12	No accessories required.	
NI WSN-3202 Analog Input Node (Americas)	780997-02	No accessories required.	
NI WSN-3202 Analog Input Node (Europe/Asia)	780997-12	No accessories required.	
NI WSN-3212 Thermocouple Input Node (Americas)	780998-02	No accessories required.	
NI WSN-3212 Thermocouple Input Node (Europe/Asia)	780998-12	No accessories required.	
NI WSN-3226 Voltage/RTD Combination Node (Americas)	781295-02	No accessories required.	
NI WSN-3226 Voltage/RTD Combination Node (Europe/Asia)	781295-12	No accessories required.	
NI WSN-3214 Strain Gauge/Bridge Completion Node (Americas)	781636-02	No accessories required.	
NI WSN-3214 Strain Gauge/Bridge Completion Node (Europe/Asia)	781636-12	No accessories required.	
NI WSN-3230 RS-232 Serial Node (Americas)	781637-02	No accessories required.	

NI WSN-3230 RS-232 Serial Node (Europe/Asia)	781637-12	No accessories required.
NI WSN-3231 RS-485 Serial Node (Americas)	781977-02	No accessories required.
WSN Gateways		
NI WSN-9791 Ethernet Gateway (Americas)	780996-01	No accessories required.
NI WSN-9791 Ethernet Gateway (Europe/Asia)	780996-11	No accessories required.
NI 9792 Programmable WSN Gateway (Americas)	781294-01	No accessories required.
NI 9792 Programmable WSN Gateway (Europe/Asia)	781294-11	No accessories required.
NI 9795 WSN C Series Gateway	781992-01	No accessories required.

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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. 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 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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Detailed Specifications

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

For the NI WSN-32*xx* specifications, refer to the device user guides.

Wireless Characteristics	
Radio mode	IEEE 802.15.4
RF data rate	250 kbits/s
Frequency band [1]	ISM 2.4 GHz (2400 MHz to 2483.5 MHz)
Channels [2]	11–24
TX power	

Version	Maximum Radio Output	Outdoor Range
Americas	+17 dBm max (50 mW)	Up to 300 m
Europe/Asia	+10 dBm max (10 mW)	Up to 150 m

Modulation type	DSSS (O-QPSK)
Receiver sensitivity	–102 dBm
Antenna	
Connector	Female RP-SMA connector
VSWR	MAX 2.0
Impedance	50 Ω
Directivity	Omni
Nominal gain	1.5 dBi

Antenna Dimensions	
Not attached	+5.71 mm (+0.225 in.)
Attached, fully extended	+108.7 mm (+4.28 in.)

Note Refer to the *Dimensions* section in the *NI WSN-9791 User Guide and Specifications* for device dimensions with the antenna attached.

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 IP configuration	DHCP + Link–Local, Static
Communication rates	10/100 Mbits/s, auto-negotiated
Maximum cabling distance	100 m/segment

Power Requirements	

Caution You must use a UL Listed ITE power supply marked LPS with the NI 9791.

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

Physical Characteristics	
Weight	Approx. 250 g (8.8 oz)
Weight with antenna	Approx. 259 g (9.1 oz)
Dimensions	Refer to the *Dimensions* section in the *NI WSN-9791 User Guide and Specifications* for device dimensions.

Safety Standards

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

The NI WSN-9791 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, 60215, & FCC 1.1310 Radiation Exposure Limits

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

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 between the radiator and the person's body (excluding extremities: hands, wrists, feet, and legs).

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 (IEC 61326): Class A emissions; Basic Immunity
EN 55011 (CISPR 11); Group 1, Class A emissions
AZ/NZS CISPR 11: Group 1, Class A emissions
FCC 47 CFR Part 15B: Class A emissions
ICES-001: Class A emissions

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.

EU Regulatory Statements

cs Česky [Czech]	National Instruments tímto prohlašuje, _e tento NI WSN-9791 je ve shodě se základními po_adavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
da Dansk [Danish]	Undertegnede National Instruments erklćrer herved, at fřlgende udstyr NI WSN-9791 overholder de vćsentlige krav og řvrige relevante krav i direktiv 1999/5/EF.
de Deutsch [German]	Hiermit erklärt National Instruments, dass sich das Gerät NI WSN-9791 in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
et Eesti [Estonian]	Käesolevaga kinnitabNational Instruments seadme NI WSN-9791 vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
en English	Hereby, National Instruments, declares that this NI WSN-9791 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
es Español [Spanish]	Por medio de la presente National Instruments declara que el NI WSN-9791 cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
el Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ National Instruments ΔΗΛΩΝΕΙ ΟΤΙ NI WSN-9791WSN-9791 ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
fr Français [French]	Par la présente National Instruments déclare que l'appareil NI WSN-9791 est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
it Italiano [Italian]	Con la presente National Instruments dichiara che questo NI WSN-9791 è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
lv Latviski [Latvian]	Ar šo National Instruments deklarē, ka NI WSN-9791 atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
lt Lietuvių [Lithuanian]	Šiuo National Instruments deklaruoja, kad šis NI WSN-9791 atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
nl Nederlands [Dutch]	Hierbij verklaart National Instruments dat het toestel NI WSN-9791 in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
mt Malti [Maltese]	Hawnhekk, National Instruments, jiddikjara li dan NI WSN-9791 jikkonforma mal-htigijiet essenzjali u ma provvedimenti ohrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
hu Magyar [Hungarian]	Alulírott, National Instruments nyilatkozom, hogy a NI WSN-9791 megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.

pl Polski [Polish]	Niniejszym National Instruments. oświadcza, że NI WSN-9791 jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
pt Português [Portuguese]	National Instruments declara que este NI WSN-9791 está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
sl Slovensko [Slovenian]	National Instruments izjavlja, da je ta NI WSN-9791 v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
sk Slovensky [Slovak]	National Instruments týmto vyhlasuje, _e NI WSN-9791 spĺňa základné po_iadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
fi Suomi [Finnish]	National Instruments vakuuttaa täten että NI WSN-9791 tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
sv Svenska [Swedish]	Härmed intygar National Instruments att denna NI WSN-9791 står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Íslenska [Icelandic]	Hér með lýsir National Instruments yfir því að NI WSN-9791 er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
no Norsk [Norwegian]	National Instruments erklærer herved at utstyret NI WSN-9791 er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

Shock and Vibration

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

Environmental

The NI WSN-9791 device 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)	–30 to 70 °C
Storage temperature (IEC-60068-2-1 and IEC-60068-2-2)	–40 to 70 °C
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

CE Compliance CE

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)

Online Product Certification

To obtain product certifications and 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.

Regulatory Information

United States

This product generates and radiates radio frequency energy. To comply with the radio frequency radiation exposure guidelines in an uncontrolled environment, this equipment must be installed and operated while maintaining a minimum body-to-antenna distance of 20 cm.

This product complies with Part 15 of the FCC Rules. Operation is subject to these two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This product does not contain any user serviceable components. Any unauthorized product changes or modifications will invalidate the warranty and all applicable regulatory certifications and approvals.

Canada

This product complies with Industry Canada RSS-210.

Cet appareil est conforme aux norme RSS210 d'Industrie Canada.

Europe—EU Declaration of Conformity

Marking by the above CE symbol on the label indicates compliance with the Essential Requirements of the R&TTE Directive of the European Union (1999/5/EC). This equipment meets the following conformance standards: EN 300 893, EN300 328, EN301 489-17, EN60950.

Europe – Restrictions for Use of 2.4 GHz Frequencies in European Community Countries

Environmental Management

België/ Belgique:	For private usage outside buildings across public grounds over less than 300m no special registration with IBPT/BIPT is required. Registration to IBPT/BIPT is required for private usage outside buildings across public grounds over more than 300m. For registration and license please contact IBPT/BIPT.
	Voor privé-gebruik buiten gebouw over publieke groud over afstand kleiner dan 300m geen registratie bij BIPT/IBPT nodig; voor gebruik over afstand groter dan 300m is wel registratie bij BIPT/IBPT nodig. Voor registratie of licentie kunt u contact opnemen met BIPT.
	Dans le cas d'une utilisation privée, à l'extérieur d'un bâtiment, au-dessus d'un espace public, aucun enregistrement n'est nécessaire pour une distance de moins de 300m. Pour une distance supérieure à 300m un enregistrement auprès de l'IBPT est requise. Pour les enregistrements et licences, veuillez contacter l'IBPT.
Deutschland:	License required for outdoor installations. Check with reseller for procedure to follow.
	Anmeldung im Outdoor-Bereich notwendig, aber nicht genehmigungspflichtig.Bitte mit Händler die Vorgehensweise abstimmen.
France:	Restricted frequency band: only channels 1 to 7 (2400 MHz and 2454 MHz respectively) may be used outdoors in France.
	Bande de fréquence restreinte : seuls les canaux 1- 7 (2400 et 2454 MHz respectivement) doivent être utilisés endroits extérieur en France. Vous pouvez contacter l'Autorité de Régulation des Télécommuniations (http://www.art-telecom.fr) pour la procédure à suivre.
Italia:	License required for indoor use. Use with outdoor installations not allowed.
	E'necessaria la concessione ministeriale anche per l'uso interno. Verificare con i rivenditori la procedura da seguire.
Nederland:	License required for outdoor installations. Check with reseller for procedure to follow.
	Licentie verplicht voor gebruik met buitenantennes. Neem contact op met verkoper voor juiste procedure.

Japan

The certified radio equipment is embedded in this device.

201WW 08215142 本機器には認証済み無線設備が内蔵されています

Singapore

Complies with IDA Standards DA105692

Taiwan R.O.C.

低功率電波輻射性電機管理辦法
第十二條經型式認證合格之低功率射頻電機，非經許可，公司、商號
用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條低功率射頻電機之使用不得影響飛航安全及幹擾合法通信；
現有幹擾現象時，應立即停用，並改善至無幹擾時方得繼續使用。
前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍

Environmental Management

NI 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 the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit ni.com/environment/weee.htm.

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中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。
关于 National Instruments 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。
(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

[1] Due to regulations, the frequency bands depend upon the country of operation.
[2] Due to regulations, the valid channels depend upon country of operation.

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