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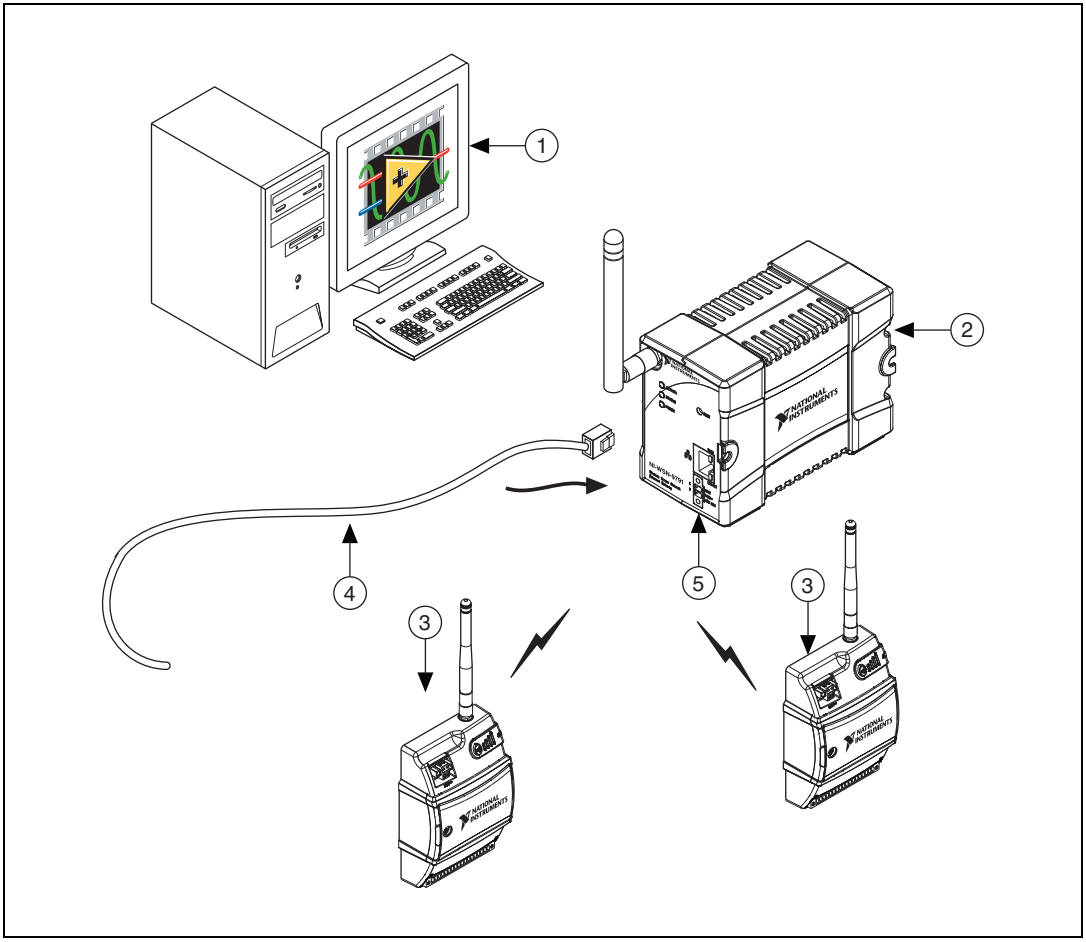
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Find the *National Instruments WSN-9791* at our website: ***Click HERE***

USER GUIDE AND SPECIFICATIONS

NI WSN-9791 Ethernet Gateway

This user guide describes how to use the NI Wireless Sensor Network WSN-9791 Ethernet gateway and lists specifications. The NI WSN-9791 provides an Ethernet data acquisition interface. The NI WSN-9791 combines with NI WSN-32*xx* nodes to form a wireless sensor network. Figure 1 shows the components of the NI WSN system.



1	PC or NI Real-Time Hardware Running Application Software	3	NI WSN-32*xx* Nodes
2	NI WSN-9791 Ethernet Gateway	4	Ethernet Cable/Connection
		5	9–30 VDC Power Supply Connection

Figure 1. NI WSN System Components

NATIONAL INSTRUMENTS

Figure 2 shows a close up of the NI WSN-9791.

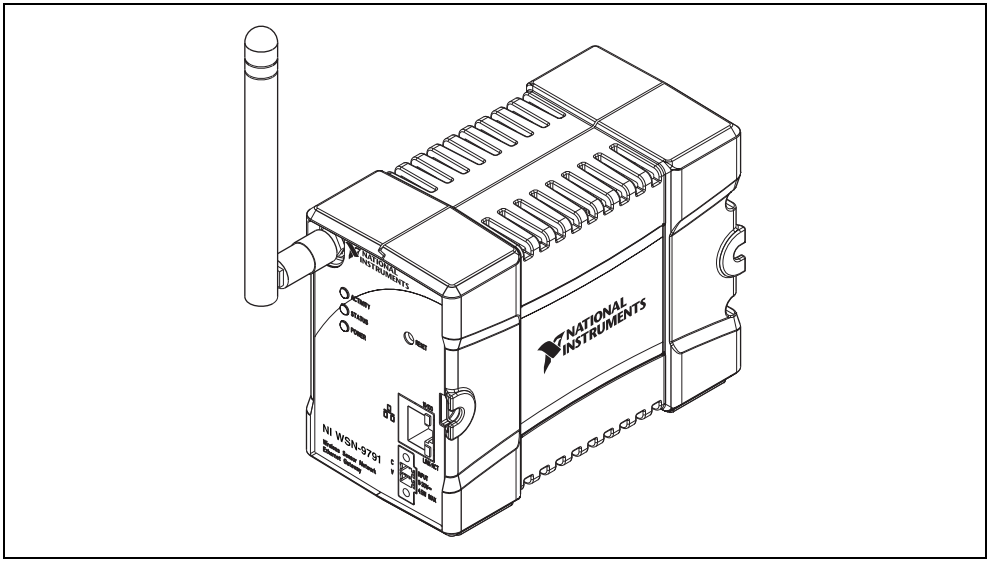


Figure 2. NI WSN-9791 Ethernet Gateway

Dimensions

Figure 3 shows the NI WSN-9791 device dimensions.

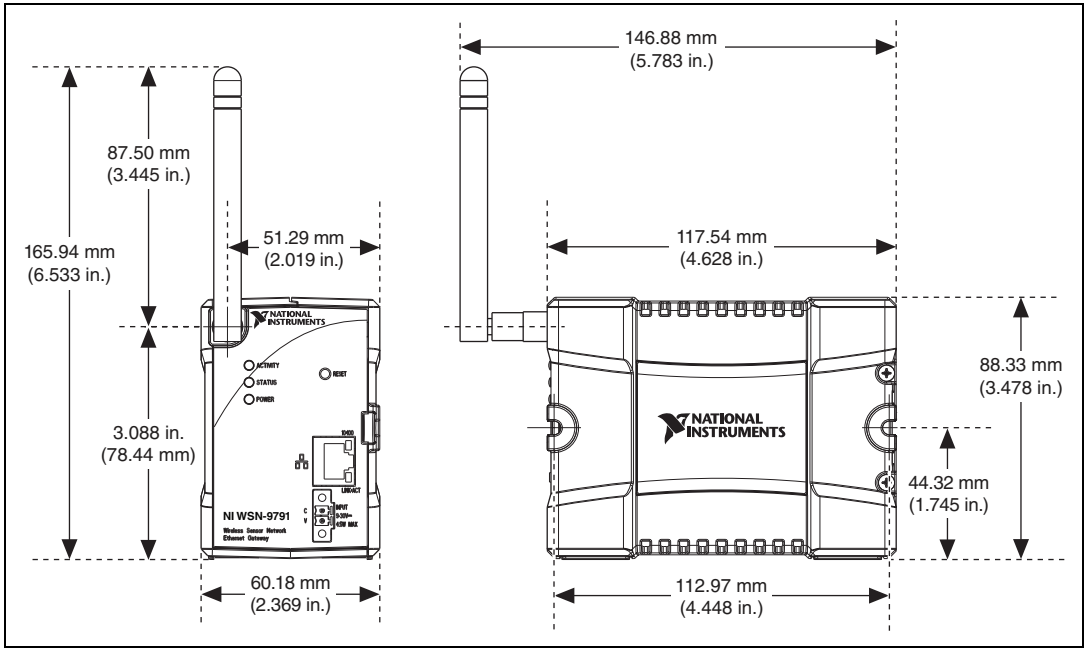


Figure 3. NI WSN-9791 Device Dimensions

Operate the NI WSN-9791 only as described in this user guide.



Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.

NI WSN Safety Information

The following section contains important safety information that you *must* follow when installing and using NI WSN products.



Caution Do *not* substitute parts or modify the NI WSN product. Use the product only with the devices, accessories, and cables specified in the installation instructions.



Caution Do *not* operate a NI WSN products in an explosive atmosphere or where there may be flammable gases or fumes. If you need to operate NI WSN products in such an environment, the NI WSN products *must* be in a suitably rated enclosure.



Caution If you need to clean a NI WSN product, use a dry towel. The product *must* be completely dry and free from contaminants before you return it to service.



Caution Operate the product only at or below Pollution Degree 2. Pollution is foreign matter in a solid, liquid, or gaseous state that can reduce dielectric strength or surface resistivity. The following is a description of pollution degrees:

- Pollution Degree 1 means no pollution or only dry, nonconductive pollution occurs. The pollution has no influence.
- Pollution Degree 2 means that only nonconductive pollution occurs in most cases. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution Degree 3 means that conductive pollution occurs, or dry, nonconductive pollution occurs which becomes conductive due to condensation.



Caution You *must* insulate signal connections for the maximum voltage for which the NI WSN product is rated. Do *not* exceed the maximum ratings for the product. Do *not* install wiring while the product is live with electrical signals. Do *not* remove or add connector blocks when power is connected to the NI WSN system. Avoid contact between your body and the connector block signal wiring when hot-swapping devices.

Operate NI WSN products at or below the *installation category*[1] marked on the hardware label. Measurement circuits are subjected to *working voltages*[2] and transient stresses (overvoltage) from the circuit to which they are connected during measurement or test. Installation categories establish standard impulse withstand voltage levels that commonly occur in electrical distribution systems. The following is a description of installation categories:

- Installation Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS[3] voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal

[1] Installation categories, also referred to as *measurement categories*, are defined in electrical safety standard IEC 61010-1.

[2] Working voltage is the highest rms value of an AC or DC voltage that can occur across any particular insulation.

[3] MAINS is defined as a hazardous live electrical supply system that powers equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

- Installation 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 (for example, 115 V for U.S. or 230 V for Europe). Examples of Installation Category II are measurements performed on household appliances, portable tools, and similar products.
- Installation Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hard-wired equipment such as equipment in fixed installations, distribution boards, and circuit breakers. Other examples are wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and stationary motors with permanent connections to fixed installations.
- Installation Category IV is for measurements performed at the primary electrical supply installation (<1,000 V). Examples include electricity meters and measurements on primary overcurrent protection devices and on ripple control units.

Safety Guidelines for Hazardous Locations

The NI WSN-9791 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nC IIC T4 and Ex nL IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI WSN-9791 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.

Caution Do *not* disconnect the power supply wires and connectors from the gateway unless power has been switched off.

Caution Do *not* install or remove the gateway unless power has been switched off.

Caution Substitution of components may impair suitability for Class I, Division 2.

Caution For Zone 2 applications, install the WSN system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.

Special Conditions for Hazardous Locations Use in Europe

The NI WSN-9791 has been evaluated as Ex nA nL IIC T4 equipment under DEMKO Certificate No. 07 ATEX 0626664X. Each gateway is marked II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of –40 °C ≤ Ta ≤ 70 °C.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) as stated in the product specifications. These requirements and limits are designed to provide reasonable protection against harmful interference when the product is operated in its intended operational electromagnetic environment.

This product is intended for use in industrial locations. There is no guarantee that harmful interference will not occur in a particular installation, when the product is connected to a test object, or if the product is used in residential areas. To minimize the potential for the product to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.

The following statements contain important EMC information needed before installing and using this product:

Caution This product is intended for use in industrial locations. As a result, this product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

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

Caution Operate this product only with shielded cables and accessories.

Related Documentation

Check `ni.com/manuals` for the most recent hardware documentation. For a complete list of documentation related to the NI WSN system, refer to `ni.com/info` and enter `rdwsnrd`.

In addition to this guide, the following documents may be useful when configuring your NI WSN system:

- *NI Wireless Sensor Network Getting Started Guide*
- *NI WSN-32xx User Guide and Specifications*
- *Configuring WSN in MAX*, available from **Start»All Programs»National Instruments»NI-WSN**
- The *NI-WSN* book on the Contents tab of the *LabVIEW Help* available by selecting **Help»Search the LabVIEW Help** in LabVIEW
- *NI-WSN Readme*, available on the software installation disc included with your device.

Training Courses

If you need more help getting started developing an application with NI products, NI offers training courses. To enroll in a course or obtain a detailed course outline, refer to `ni.com/training`.

Technical Support on the Web

For additional support, refer to `ni.com/support` or `zone.ni.com`.

Software Overview

Note Refer to the *NI WSN Readme*, available on the software installation disc included with your device, for NI software application version support.

The NI-WSN software includes NI Measurement and Automation Explorer (MAX) as well as server and driver software for easy integration into application software packages. These software components manage the low-level communications and hardware details, simplifying programmatic access to I/O channels. The NI-WSN software is on the software installation disc included with your NI WSN-9791 gateway device. The NI-WSN software is supported by Windows 7/Vista/XP and contains the following components:

- NI MAX
- NI-WSN software

You can download a current version of the NI-WSN software from `ni.com/support`. Using your web browser, go to `ni.com/support` and select **Drivers and Updates»Distributed I/O»Wireless Sensor Networks**, then select the latest version of NI-WSN software. If you are using other software, refer to the installation instructions that accompany your software.

What You Need to Get Started

To set up and use NI LabVIEW for WSN with the NI WSN-9791, you need the following:

- NI WSN-9791 Ethernet Gateway device(s), with 9–30 V power supply
- NI WSN-32*xx* node devices with a 9–30 V power supply or four 1.5 V AA alkaline for each node
- Mounting hardware (DIN rail, panel-mount, or rack mount accessory)
- Ethernet cable/connection
- Screwdrivers: a 1/8 in. flathead and a number 1 Phillips
- NI-WSN software version 1.1 or later
- Host PC running Windows 7/Vista/XP
- NI LabVIEW version 8.6.1 (32-bit) or later
- NI LabVIEW Real-Time Module (32-bit)
- Related hardware and software documentation
- Optional accessories
    - DIN rail terminal blocks
    - I/O cables and sensors
    - Mounting accessory

Unpack the Devices and Install the Antenna

Remove the devices from the package and inspect the device. Contact NI if the device appears damaged. Do *not* install a damaged device.

Caution The device is static sensitive. Always properly ground yourself and the equipment when handling or connecting to the device.

To attach the antenna, align the antenna with the mount and screw it on as shown in Figure 4.

Caution The antenna must be attached to the NI WSN device in order for the NI WSN device to function correctly.

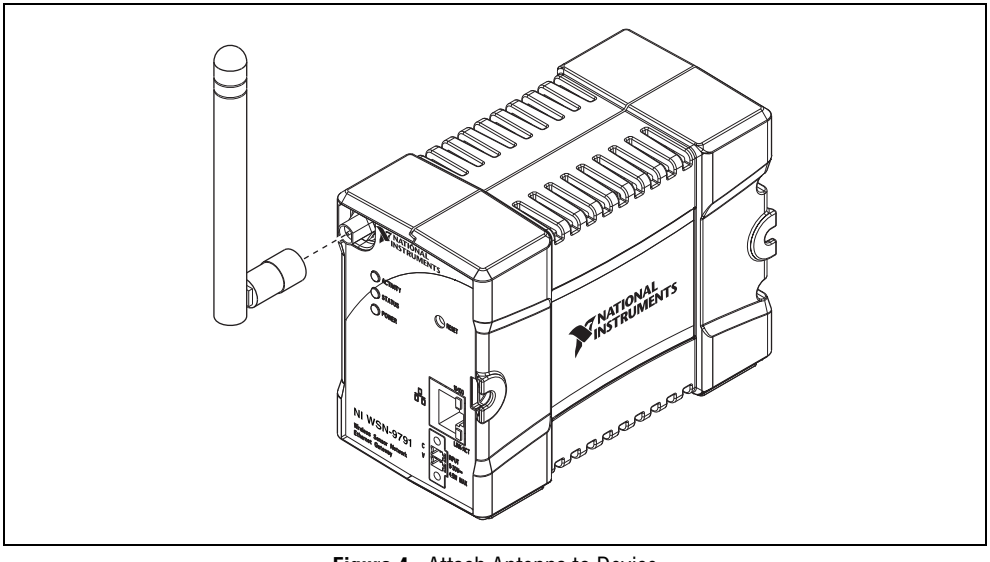


Figure 4. Attach Antenna to Device

Mounting the NI WSN-9791 Device

You can mount the NI WSN-9791 device on a panel or on a 35 mm DIN rail. For kit accessory ordering information, refer to the accessory section of the NI WSN product page at `ni.com`.

Caution Your installation must meet the following requirements:

- Allows 25.4 mm (1 in.) of clearance above and below the NI WSN-9791 device for air circulation.
- Allows 50.8 mm (2 in.) of clearance in front of modules for common connector cabling, such as the 2-position detachable screw terminal connector.

Note Figure 5 is an actual size template. You can print it out and use it to determine screw hole placement for panel mounting.

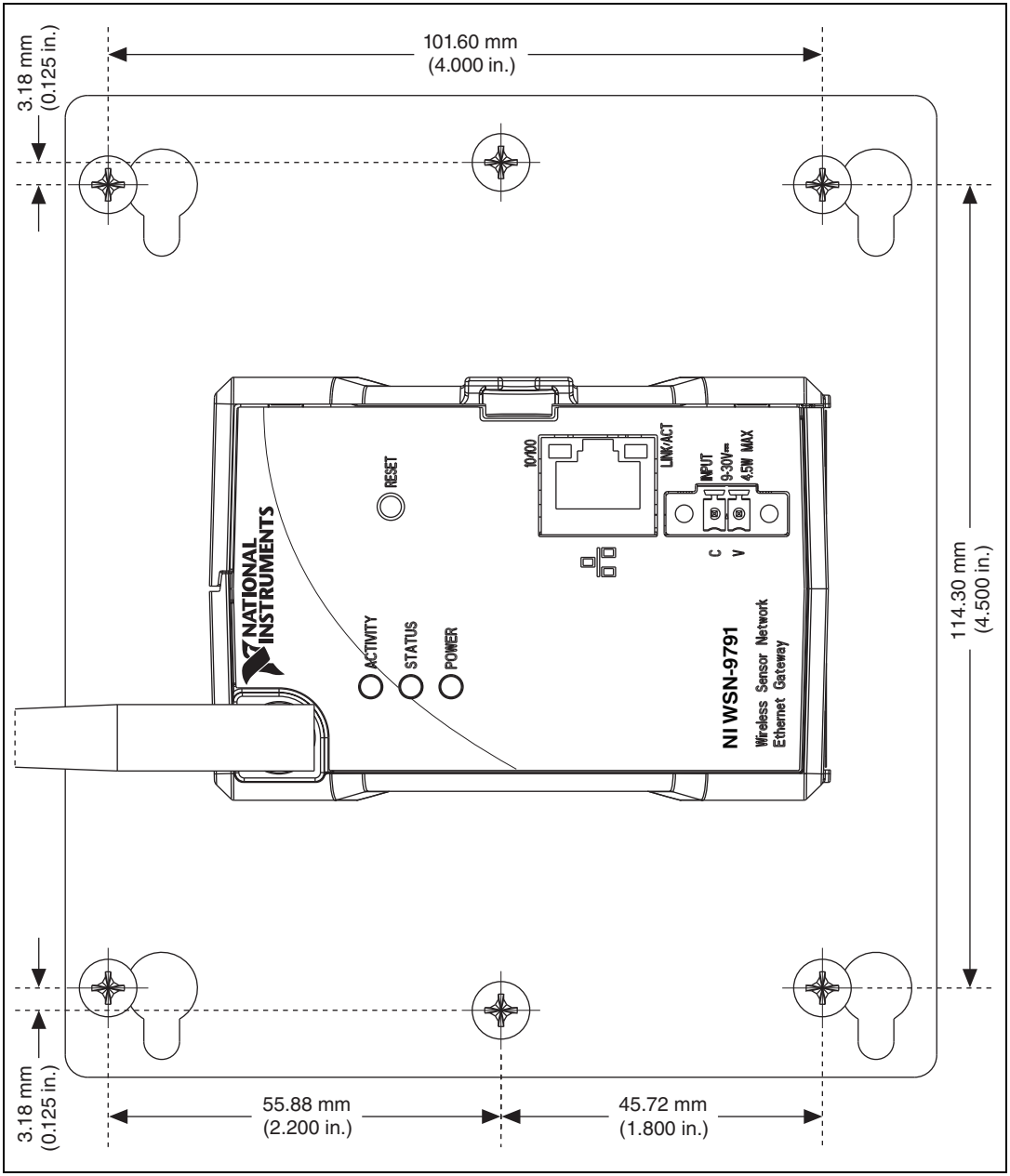


Figure 5. NI WSN-9791 Panel Mount Dimensions Template

Using the Integrated Panel Mount Feature

The NI WSN-9791 integrated panel mount feature accepts number 8 or M4 pan head screws to secure the device onto a flat surface. To install the NI WSN-9791 on a flat surface, complete the following steps:

1. Prepare two holes in your panel 4.448 in. (112.97 mm) on center to accept the number 8 or M4 pan head screws or bolts.
2. Install the front screw first in the mounting panel leaving .08 in. space under the head of the screw.
3. Slide the NI WSN-9791 front mount under this screw.
4. Fasten the rear screw into place through the rear enclosure mount of the NI WSN-9791.

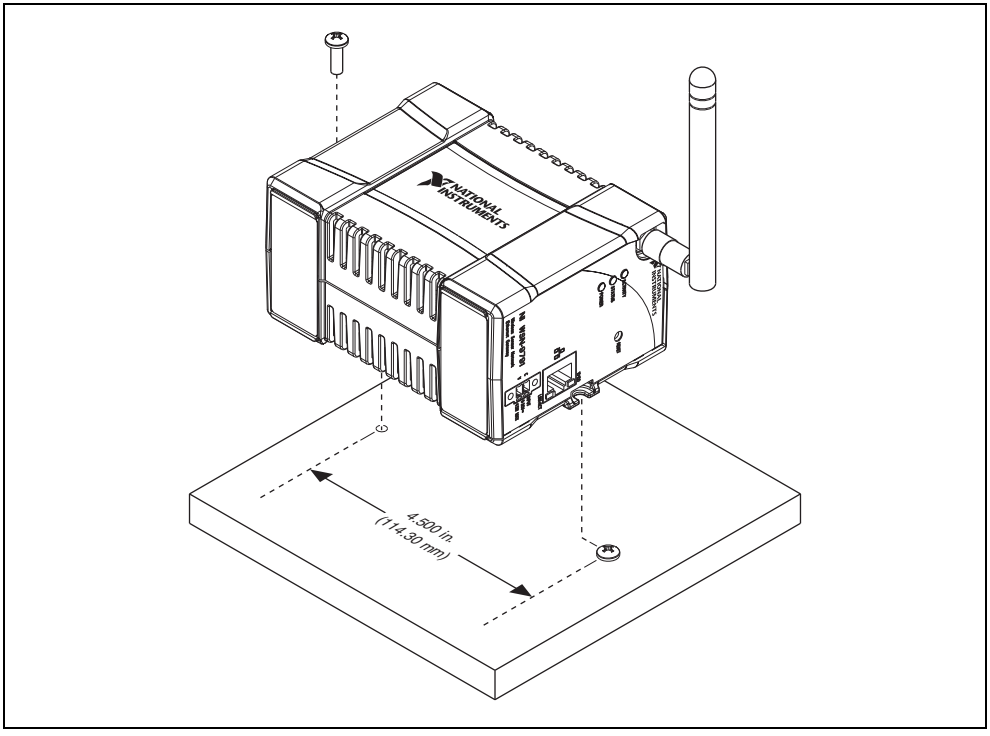


Figure 6. Using the Integrated Mount Feature

Attaching to the NI WSN-3282 DIN Rail

Caution Power off the device before mounting it to the DIN rail.

The NI WSN-3282 DIN rail kit, NI part number 781074-01, contains one clip for mounting the device on a standard 35 mm DIN rail. To mount the device on a DIN rail, complete the following steps:

1. Fasten the DIN rail clip to the device using a number 1 Phillips screwdriver and four 4-20, 5/16 inch length thread-forming screws. The screws are included in the DIN rail kit.
2. Make sure the DIN rail kit is installed as shown in Figure 7, with the larger lip of the DIN rail positioned up.

Note Use thread-forming screws to permanently affix the DIN rail clip to the device. Unscrewing and reinstalling the thread-forming screws will produce a compromised connection between the DIN rail clip and the device.

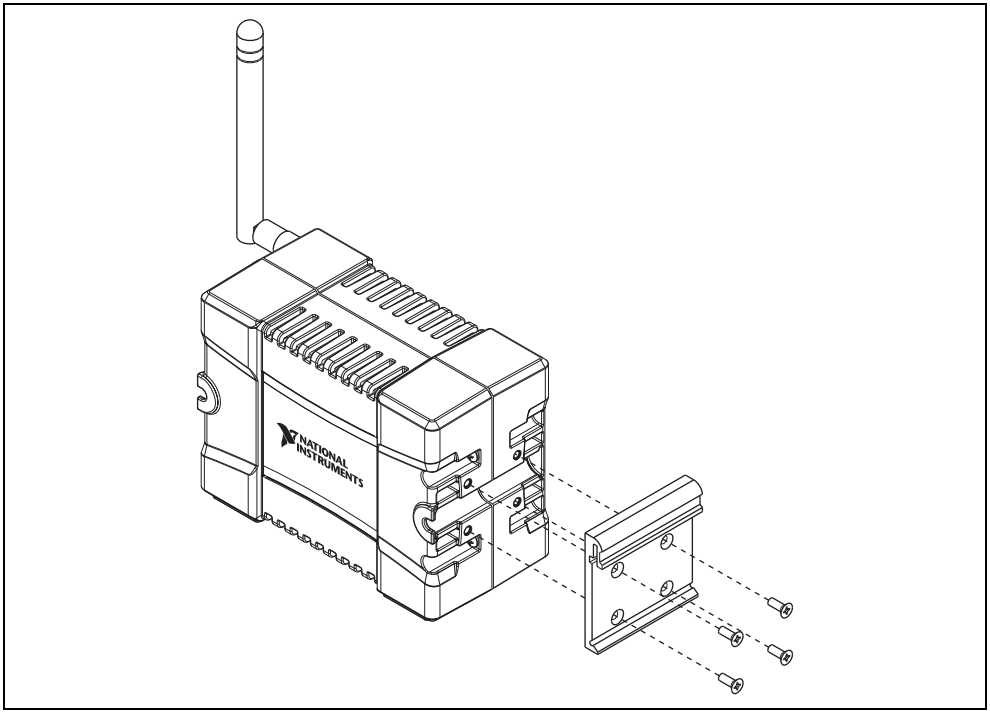


Figure 7. NI WSN-9791 Device DIN Rail Installation

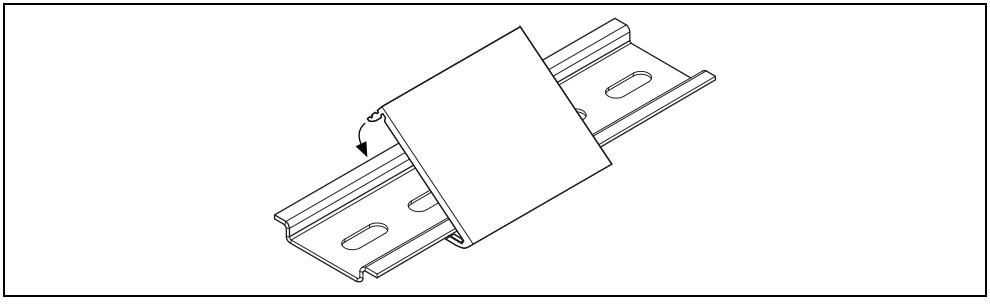


Figure 8. DIN Rail Installation Pictured Without the NI WSN-9791

Attaching to the NI WSN-3283 Panel Mount Plate

The NI WSN-3283 panel mount kit, NI part number 781075-01, contains a plate for mounting the device to a panel. To mount the device, complete the following steps:

1. Fasten the plate to the device using a number 1 Phillips screwdriver and four 4-20, 5/16 inch length thread-forming screws, as shown in Figure 9. The screws are included in the NI WSN-3283 panel mount kit.

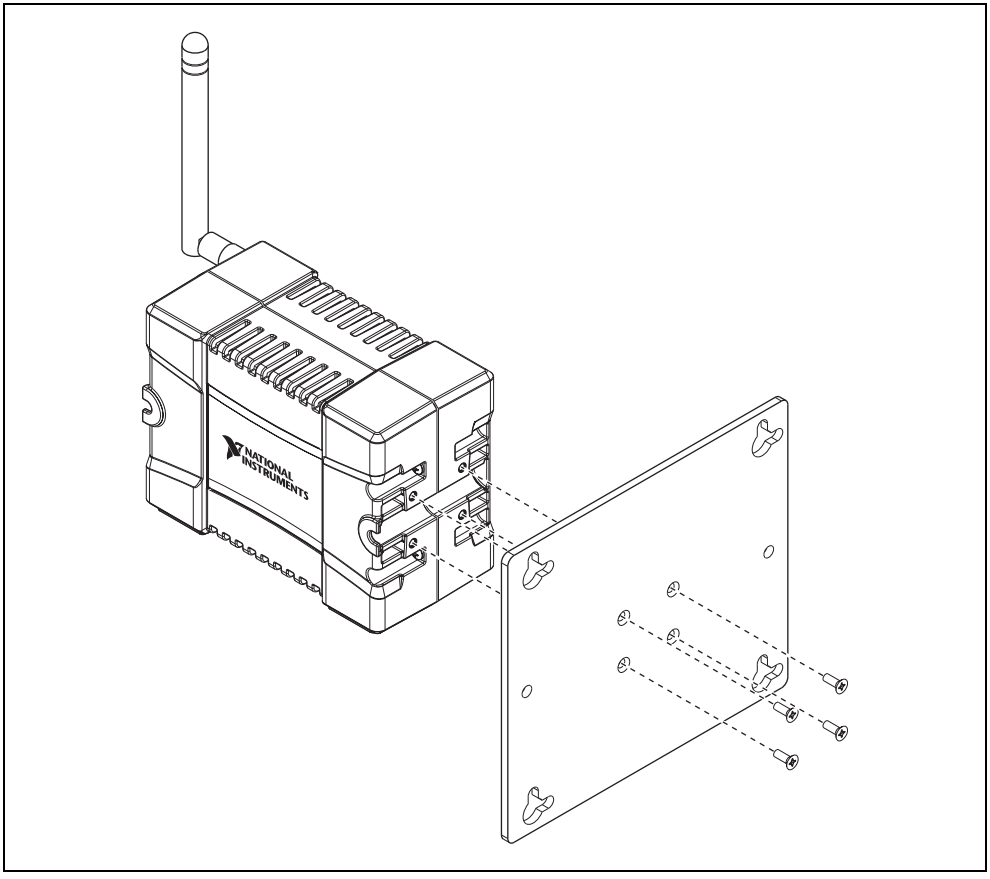


Figure 9. Mounting the NI WSN-9791 to the Panel Mount Plate

2. Attach the device and attached plate to a wall or other surface using four to six number 8 or M4 screws. Refer to Figure 5 for the mounting hole template.

Setting Up the NI WSN-9791 Device

Complete the following steps to prepare the NI WSN-9791 device for use:

1. Before connecting the hardware, install NI LabVIEW and the NI-WSN driver software. You must be an Administrator to install NI software and devices on your computer. The NI-WSN driver software is on the software installation disc included with your device and is available for download at `ni.com/support`. You must have NI LabVIEW version 8.6.1 or later installed to use NI WSN devices. Refer to the instructions included with your NI LabVIEW software to install NI LabVIEW. Once NI LabVIEW is installed, complete the following steps:
2. Close all other applications.
3. Insert the NI-WSN software installation disc into the drive on your computer.
4. Follow the onscreen instructions to install the NI-WSN software and NI MAX.

Note The *NI Wireless Sensor Network Getting Started Guide* is available after installation from **Start»All Programs»National Instruments»NI-WSN**.

5. Make sure the NI WSN-9791 device power is disconnected.

Powering the NI WSN-9791 Device

Caution You must use a UL Listed ITE power supply marked LPS with the NI 9791. The power supply must also meet any safety and compliance requirements for the country of use.

To connect an external power supply to the NI WSN-9791, complete the following steps:

1. Remove the 2-position mini-combicon plug from the device, loosening the retaining screws if necessary.

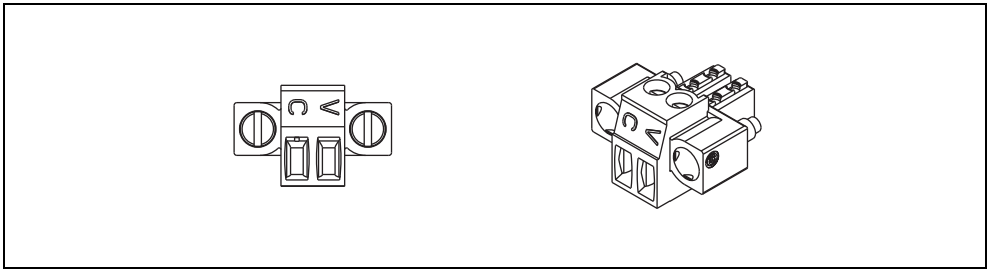


Figure 10. 2 Mini-Combicon Connector

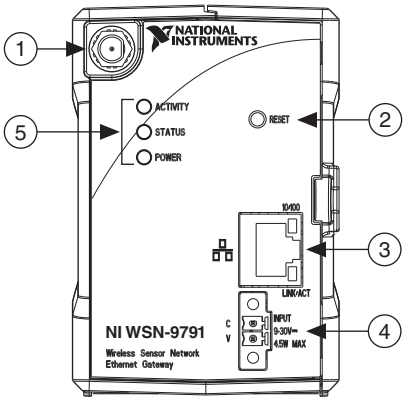
2. Connect the positive lead of the external power supply to the V terminal.
3. Connect the negative (common) lead to the C terminal.
4. Reinstall the 2-position mini-combicon plug in the device and tighten the retaining screws.

10/100BaseT(X) Ethernet Port Connection

Use a standard Category 5 (CAT-5) Ethernet cable (a shielded cable is recommended) to connect the NI WSN-9791 device to an Ethernet hub or to a computer.

Device Interface

Figure 11 shows the NI WSN-9791 device interface.



1	Antenna RP-SMA Connector	4	9–30 VDC Power Connector
2	RESET Button	5	LEDs: ACTIVITY, STATUS, and POWER
3	RJ45 Ethernet Port, 10/100 LED, LINK/ACT LED		

Figure 11. NI WSN-9791 Device Interface

Reset Button

The NI WSN-9791 is equipped with a reset button as shown in Figure 11.

Pressing the reset button results in the following device responses:

- When pressed for fewer than 5 seconds, the device reboots with the current configuration.
- When pressed for 5 seconds or more, the STATUS LED turns on. When released, the device reboots into Factory Default Mode, which returns the device user configuration to the factory-set defaults.

Signal Strength/Status LED Indicators

The signal strength/status LED indicators for the NI WSN-9791 device are listed in Table 1.

Table 1. LED State/Device Status

LED Description	Color	LED State	Device Status
10/100	Green	On	Connected at 100 Mbps
		Off	No Ethernet connection or 10 Mbps connection
LINK/ACT	Yellow	On	Ethernet link
		Off	No Ethernet connection
		Blinking	Ethernet activity
POWER	Green	On	Power on
		Off	Power off

Table 1. LED State/Device Status (Continued)

LED Description	Color	LED State	Device Status
STATUS	Yellow	On	Device firmware booting or resetting to factory default
		Off	Normal operation
		1 Blink	Radio error
		2 Blinks	Firmware/FPGA image corrupted, update firmware through NI MAX
		3 Blinks	Firmware error, reboot
ACTIVITY	Green	On	Radio is active and sending or receiving data
		Off	No radio activity

Using the NI WSN-9791

Firmware

The firmware is updated in NI MAX. To update the NI WSN-9791 Ethernet Gateway firmware, complete the following steps:

1. Open NI MAX.
2. Select the NI WSN-9791 Ethernet Gateway for which you want to update firmware.
3. Click **the Gateway Firmware** tab.
4. Click **Browse** and select the firmware file.
5. Click **Update Firmware**.
6. Follow the prompt to reboot and apply changes.

For more information, refer to **Start»All Programs»National Instruments»NI-WSN»Configuring WSN in MAX**.

Adding, Removing, and Replacing NI WSN-32*xx* Devices

Use NI MAX to add and remove nodes to and from your NI Wireless Sensor Network.You can remove and insert NI WSN-32*xx* devices while the system is operating and without powering down the NI WSN system. NI WSN-32*xx* devices already working in the system remain operational and accessible on the network. Commands sent to a missing NI WSN-32*xx* device return an error response, but the NI WSN-9791 stores the commands and applies the effects of the commands if a suitable replacement is installed

When you remove a NI WSN-32*xx* device and add a new one, the NI WSN-9791 first verifies that the replacement device is compatible with the one that was removed. If it is compatible, the NI WSN-9791 device configures the replacement NI WSN-32*xx* device with the previous device settings.

For more information, refer to **Start»All Programs»National Instruments»NI-WSN»Configuring WSN in MAX**.

The NI WSN system is built on an IEEE 802.15.4 wireless mesh network. The 802.15.4 radio in each NI WSN device provides for low-power communication of measurement data across a large network of devices. The NI-WSN software builds on top of that to provide network configuration and reliable communication from the host PC or PAC to the NI WSN-32*xx* node devices.

Mesh Networking

The NI WSN system consists of two types of devices: gateways and nodes. Gateways act as the network coordinator, in charge of node authentication, message buffering, and bridging from the 802.15.4 wireless network to the wired Ethernet network. Nodes primarily function as end nodes in the network to collect data and control DIO channels, but can also be programmed as routers to relay data from other nodes back to the gateway and Host PC or PAC. Use NI MAX to configure nodes as end nodes or routers. Figure 1 shows a typical NI Wireless Sensor Network.

The gateways and nodes work together to form a mesh network. The gateway maintains a list of nodes (by serial number) that have been authorized for network access. When a node powers up, it scans for available networks, locates either a gateway or router, and attempts to join it. If the gateway has the node in its list, the node joins the network, downloads the latest configuration from the gateway, and begins its normal operation of acquiring measurement data and controlling DIO.

Since each node joins a network instead of a particular router or gateway, it can find a new path back to the gateway in the event that the signal is lost or blocked to its existing network route. In this way, the mesh network is inherently self-forming and self-healing. However, this may also cause network throughput to decrease, as there is no way to force a router or end node to join to a particular device in the network. Each time a node joins through a router, the overall throughput of that node is halved, due to the fact that the node must hop to get its messages back to the gateway. Figure 12 shows an example of one possible mesh configuration.

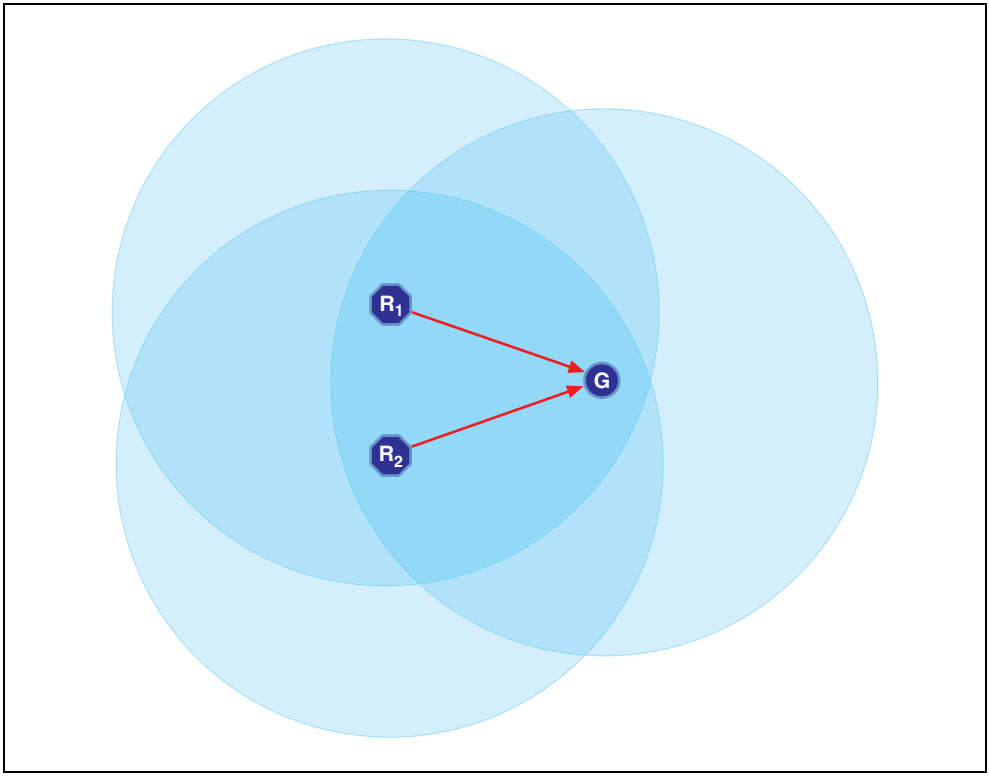


Figure 12. Mesh Configuration Example

In this configuration, R_1 (a router) and R_2 (a router) both communicate directly with the gateway. Measurements taken by both devices can directly reach the gateway without having to hop through another node. However, the configuration above does not always mesh in the same way. Figure 13 shows another possible configuration for the same network.

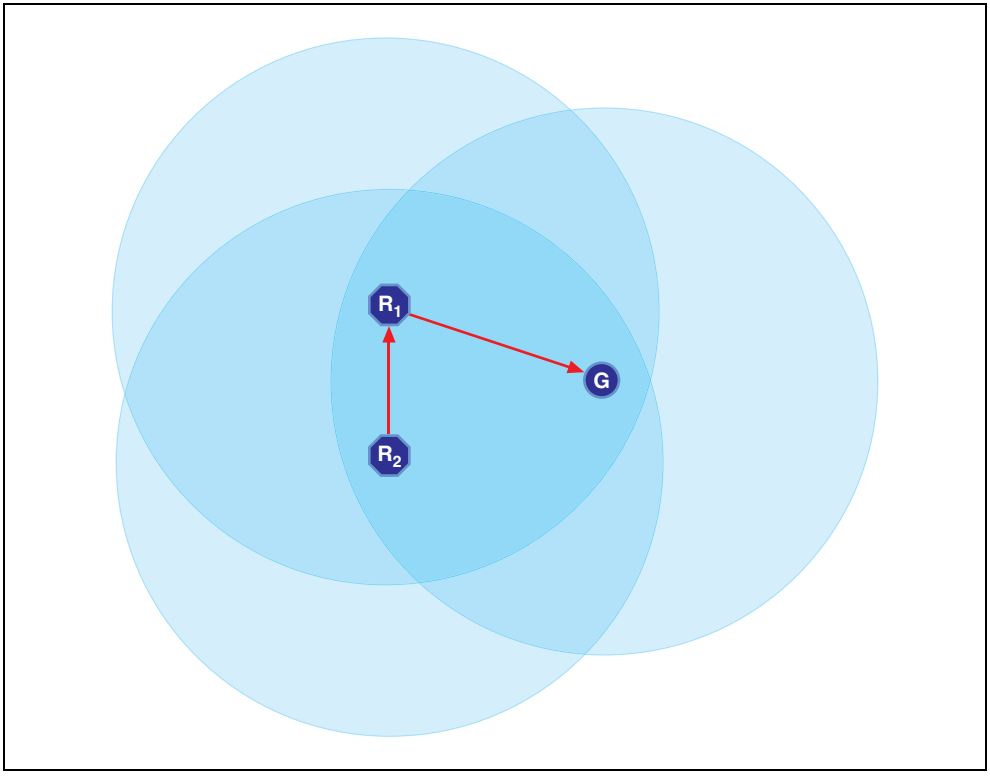


Figure 13. Same Network Configuration Example

In this configuration, R_1 can still communicate with the gateway, but R_2 is now connected through R_1. This means that all measurements taken by R_2 must hop through R_1 before making it back to the gateway. In addition, R_1 is now not only responsible for sending its own measurement data, but also the R_2 data. This configuration is considered a worst case 1-hop system, as R_2 and R_1 both have the possibility of meshing through a router that is connected to the gateway. National Instruments recommends configuring your system for no more than three hops. Configuring multiple nodes as routers and placing them within close proximity introduces the possibility that your system could mesh inefficiently. Figure 14 shows how a system could mesh efficiently, yet also have the possibility of meshing inefficiently.

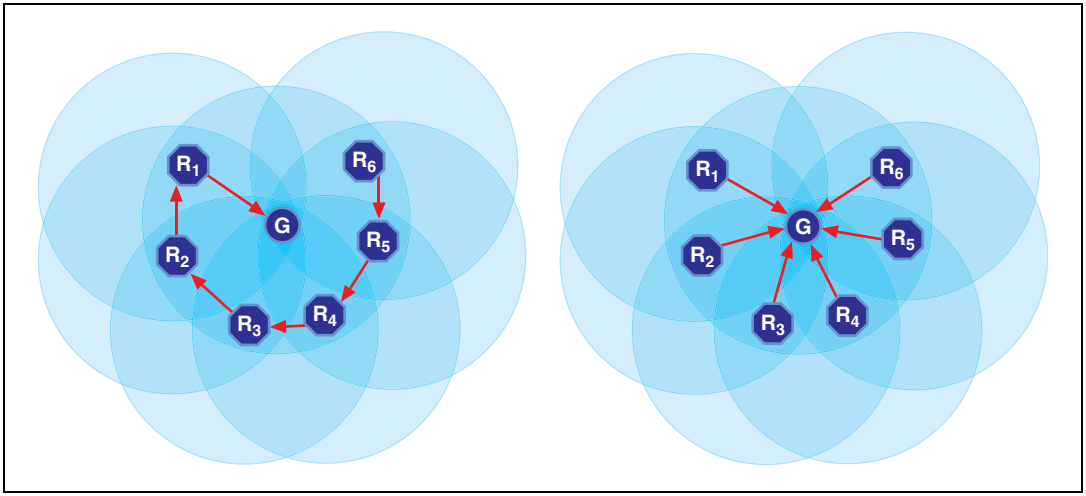


Figure 14. Inefficient Versus Efficient Meshing

The network can be improved with two separate techniques:

1. Convert some routers to end nodes.
2. Set up the network to prevent the routers from being in range of each other (spatially separated by distance, or introducing objects that increase radio interference such as buildings).

Another advantage of the mesh network is the ability to extend the distance of the end measurement from the wired Ethernet gateway. By placing mesh routers throughout the space where you wish to acquire signals, you can expand the area and distance across which measurement data can be acquired and sent. Refer to the *Specifications* section for typical line of sight ranges for the NI WSN devices. Figure 15 shows how a network can be set up to cover greater distances.

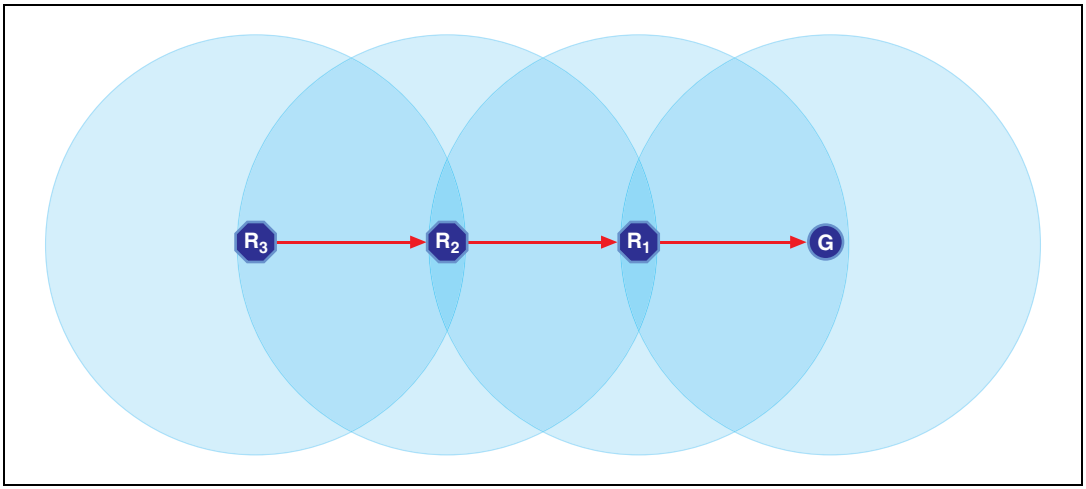


Figure 15. Network Containing Distance Example

End Node Versus Router

Each NI WSN-32*xx* node can be configured as either an end node or a router. NI WSN-32*xx* nodes are configured by default at the factory in end node mode. You can change the mode of the node using the NI-WSN software and NI MAX. One trade-off to consider when configuring nodes is power consumption. NI WSN-32*xx* nodes configured as end node are designed to be run from battery power while routers are designed to use external power at all times to send, receive, and buffer messages to and from end nodes.

Data Transfer in the NI WSN Network

The NI WSN system is built on a low-power, reliable IEEE 802.15.4 network. In order to save power and increase reliability, this network delivers a maximum theoretical throughput of 250 kbps. This correlates to a typical maximum rate of 1 sample per second per node.

Measurements taken with NI WSN-32*xx* nodes are single point acquisition. NI WSN-32*xx* devices have no onboard buffer, therefore the data is considered to be lost, meaning there is no way to retrieve past data from the device.

Configuring Your NI WSN System

As discussed in the *Mesh Networking* section, creating a reliable and efficient wireless sensor network requires an understanding of the physical environment the network will reside in, as well as an understanding of the expected meshing configuration. Additionally, the following consideration needs to be taken into account: parent devices (routers and gateways) can only have a maximum of eight end nodes connected to them at a given time.

This introduces the stranded node problem. The stranded node problem exists when a node configured as an end node has the possibility of not being able to join a device node. Figure 16 shows a network consisting of one gateway, two routers, and nine end nodes.

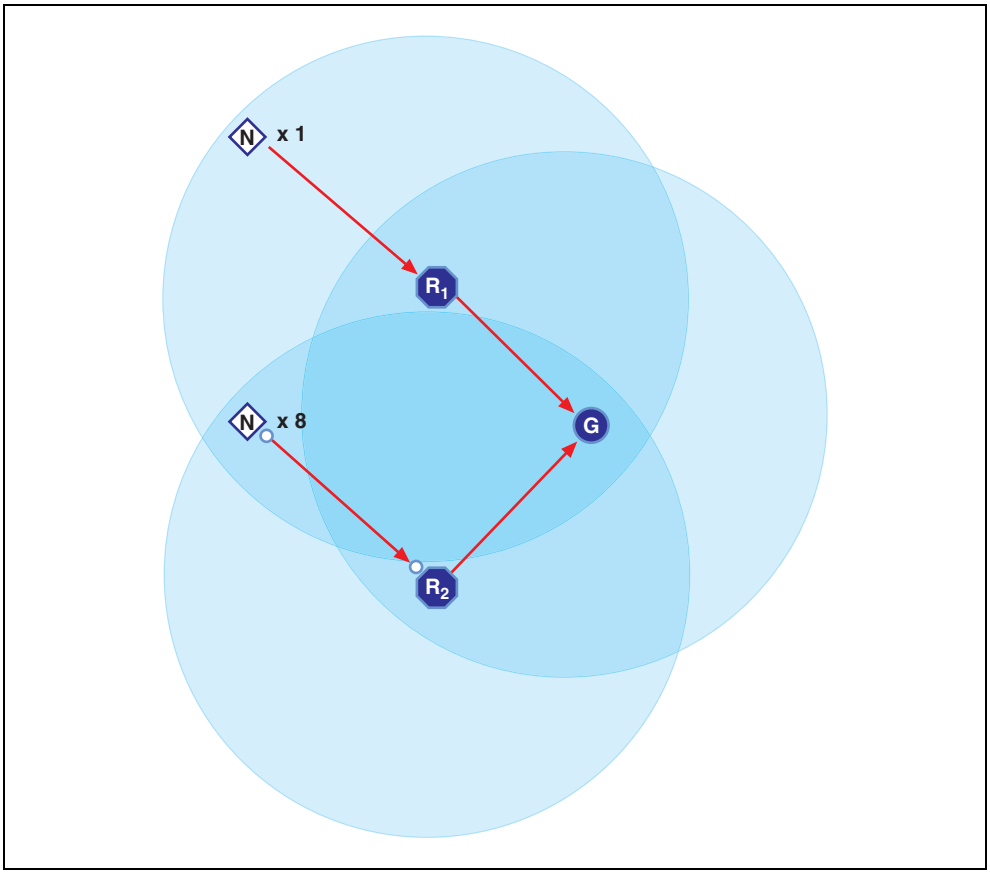


Figure 16. Network Containing Distance, Example 1

In this case, all nodes have properly meshed, and all nodes can communicate with the gateway. However, this network could potentially strand end nodes. Figure 17 shows another possible mesh of the same network.

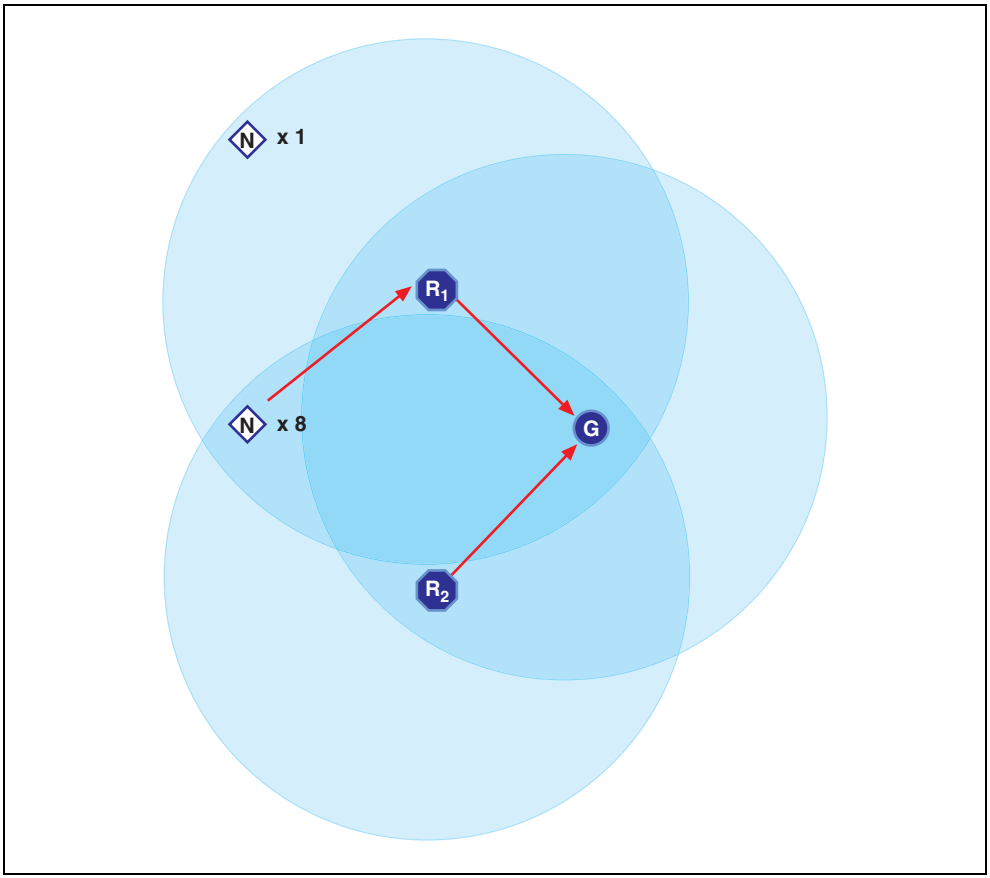


Figure 17. Network Containing Distance, Example 2

In this mesh configuration, eight end nodes in range of both R_1 and R_2 join with R_1. This leaves one end node stranded from the network. This can be corrected in the following two ways:

1. Move the set of 8 end nodes to where they can only communicate with R_2. This prevents them from possibly joining R_1.
2. Add an additional router that is in range of the single end node. This introduces the possibility of creating additional hops in the network, but also guarantees coverage of all end nodes.

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

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

[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.

Power Requirements

Caution You must use a UL Listed ITE power supply marked LPS with the NI WSN-9791. The power supply must also meet any safety and compliance requirements for the country of use.

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

Note For EMC compliance, operate this device with shielded cables. The NI WSN-9791 is guaranteed to power up when 9 V is applied to V and C. After power up, it can operate on as little as 6 V.

Physical Characteristics

Weight .....Approx. 250 g (8.8 oz)

Weight with antenna .....Approx. 259 g (9.1 oz)

Dimensions .....Refer to Figure 3 for device dimensions

Safety Standards

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.

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

Hazardous Locations

U.S. (UL) .....Class I, Division 2, Groups A, B, C, D, T4;
Class I, Zone 2, AEx nC IIC T4

Canada (C-UL) .....Class I, Division 2, Groups A, B, C, D, T4;
Class I, Zone 2, Ex nL IIC T4

Europe (DEMKO).....Ex nA nL IIC T4

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 product 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).

This product complies with the European Council Recommendation (1995/519/EC) on the limitation of exposure of the general public to electromagnetic fields. Compliance was determined in accordance with the requirements in EN 50371.

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 61326-1 (IEC 61326-1): Class A emissions; Basic 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

This product also meets the requirements of the following EMC standards for intentional radiators:

- EN 300 328
- EN 301 489-1 and EN 301 489-17
- FCC 47 CFR Part 15C
- IC RSS-210

Note For EMC certification and additional information, refer to the product label or the *EU Regulatory Statements* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

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

Regulatory Information

United States

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.

Canada

This product complies with Industry Canada RSS-210.

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

Europe—EU Declaration of Conformity CE

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

België/ Belgique:	For private usage outside buildings across public grounds over less than 300 m 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 300 m. For registration and license please contact IBPT/BIPT.
	Voor privé-gebruik buiten gebouw over publieke groud over afstand kleiner dan 300 m geen registratie bij BIPT/IBPT nodig; voor gebruik over afstand groter dan 300 m 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 300 m. Pour une distance supérieure à 300 m un enregistrement auprès de I'IBPT est requise. Pour les enregistrements et licences, veuillez contacter I'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 I'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.

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、商號或使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；經發現有幹擾現象時，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受合法通信或工業、科學及醫療用電波輻射性電機設備之幹擾。

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 kinnitab*National 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.

Polski [Polish]	Niniejszym *National Instruments*. oświadcza, że NI WSN-9791 jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português [Portuguese]	*National Instruments* declara que este NI WSN-9791 está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	*National Instruments* izjavlja, da je ta NI WSN-9791 v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	*National Instruments* týmto vyhlasuje, _e NI WSN-9791 spĺňa základné po_iadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
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.
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.
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.

Environmental

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

Pollution Degree (IEC 60664) .....2, indoor use only

Maximum altitude.....2,000 m

Indoor use only

Online Product Certification

Note 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 model number or product line, and click the appropriate link in the Certification column.

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 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 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 and Electronic Equipment, visit `ni.com/environment/weee`.

电子信息产品污染控制管理办法 （中国 RoHS）



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`.)

Where to Go for Support

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0, Belgium 32 (0) 2 757 0020,
Brazil 55 11 3262 3599, Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00, Finland 358 (0) 9 725 72511,
France 01 57 66 24 24, Germany 49 89 7413130, India 91 80 41190000, Israel 972 3 6393737,
Italy 39 02 41309277, Japan 0120-527196, Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793, Netherlands 31 (0) 348 433 466,
New Zealand 0800 553 322, Norway 47 (0) 66 90 76 60, Poland 48 22 328 90 10,
Portugal 351 210 311 210, Russia 7 495 783 6851, Singapore 1800 226 5886,
Slovenia 386 3 425 42 00, South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151, Taiwan 886 02 2377 2222,
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372777D-01 Nov10

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