

NI 5191 User Guide and Specifications

Differential Active Probe

The NI 5191 is an active differential probe with 800 MHz input bandwidth and a 10:1 attenuation ratio, allowing it to be used with high-speed digitizers such as the NI 5152/5153/5154, or with stand-alone oscilloscopes for many different high-speed measurement applications. This document contains information about the probe kit, how to install and use the probe and probe accessories, and the detailed product specifications.

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Conventions

The following conventions are used in this document:



This icon denotes a note, which alerts you to important information.



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

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 residential, commercial and industrial locations. There is no guarantee that harmful interference will not occur in a particular installation or when the product is connected to a test object. 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.

Unpacking

Remove the NI 5191 protective carrying case from the package and inspect it for damage. Open the carrying case and inspect the NI 5191 probe and accessories for any signs of damage. Notify NI if the probe or included accessories appear damaged in any way.



Caution Do *not* install and use a damaged device or accessory.

Verifying the Kit Contents

Verify that the NI 5191 kit contains the following items:

- NI 5191 differential active probe
- Differential Probe Accessory Kit with the following items:
 - Six 0.8 mm single-signal pins
 - Two 12.8 mm dual-signal pins
 - Two 16.8 mm dual-signal pins
 - One red and one black pincer clip
 - One red and one black micro test clip
 - One red and one black 5 cm extension lead
 - One red and one black 10 cm extension lead
- USB power cable
- 9 V alkaline battery
- Other included items:
 - *NI 5191 User Guide and Specifications* (this document)
 - Protective carrying case

Using the Hardware

This section describes how to install and use the NI 5191.

1. Begin by supplying power to the NI 5191 using either a 9 V battery or the provided USB power cable.
 - To install the battery, complete the following steps:
 - a. Remove the cover off the battery compartment on the back of the main probe body.

- b. Insert the battery into the compartment, connecting the + and – leads to the snap connector inside the probe body, as shown in Figure 1.

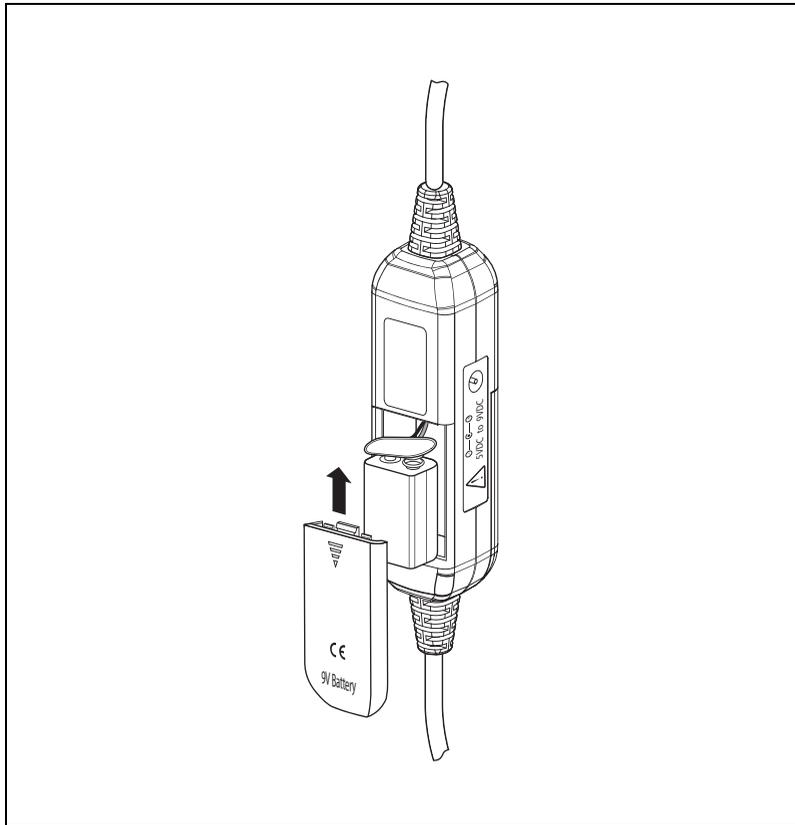


Figure 1. Installing the 9 V Battery in the NI 5191

- To install the USB power cord, plug the cable into the power input on the side of the main probe body, as shown in Figure 2, and connect the USB plug into a USB port on a computer or embedded controller.

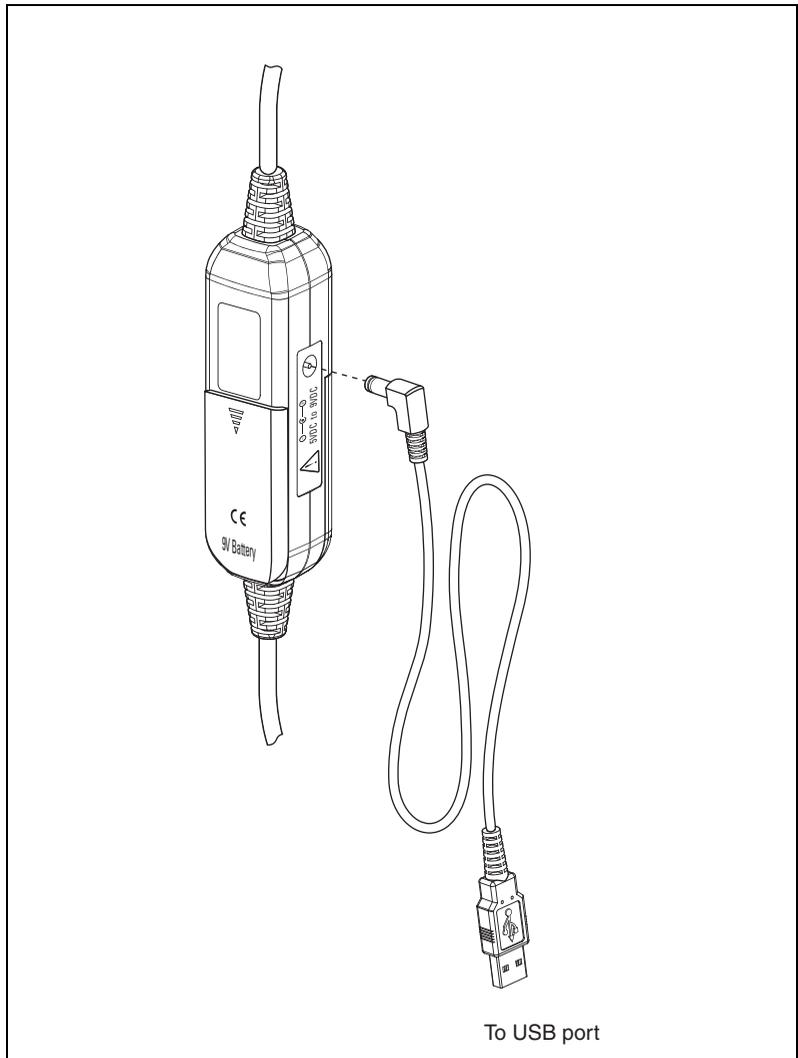


Figure 2. Plugging the USB Power Cord into the NI 5191

2. After the battery or power cable have been inserted properly, turn the power switch on and ensure that the green power LED is illuminated.
3. Connect the BNC output connector to the desired input channel of a digitizer. The digitizer input must have 50 Ω input impedance and must be ground referenced.

4. Connect the inputs of the NI 5191 to the circuit under test using the provided probe tip accessories. More information on using the probe tip accessories can be found in the *Using the Probe Tip Accessories* section of this document.



Caution To protect against electrical shock, use only the accessories supplied with the NI 5191 probe.



Caution The NI 5191 probe is intended for carrying out differential measurements between two points on the circuit under test. This probe is not intended for electrically isolating the circuit under test and the measuring instrument.

Using the Probe Tip Accessories

The NI 5191 differential active probe kit includes an accessory kit with multiple probe tip accessories. This section describes each of these accessories and their use with the NI 5191.



Note You can order additional accessory kits individually from NI.

Single-Signal and Dual-Signal Pins

These small pins are meant to be inserted directly into the openings of the probe tip and provide the best signal quality because of their short length. The single-signal pins are 0.8 mm in length and the dual-signal pins come in 12.8 mm and 16.8 mm lengths.

Extension Leads

The accessory kit includes extension leads in 5 cm and 10 cm lengths. These leads can be used to extend the length of the measurement pins if necessary for your test setup, and to allow the use of the micro test and pincer clips. First insert the extension leads directly into the openings of the probe tip, then insert signal pins or clips directly into the other ends of the extension leads.

Micro Test and Pincer Clips

The accessory kit includes two different types of test clips, including two small micro test clips and two larger pincer clips. To use these clips, complete the following steps:

1. Insert the extension leads directly into the openings of the probe tip.
2. Insert the clips into the end of the extension leads as follows:
 - Insert the micro test clip directly into the extension leads using the pin on the back end of the clip, as shown in Figure 3.

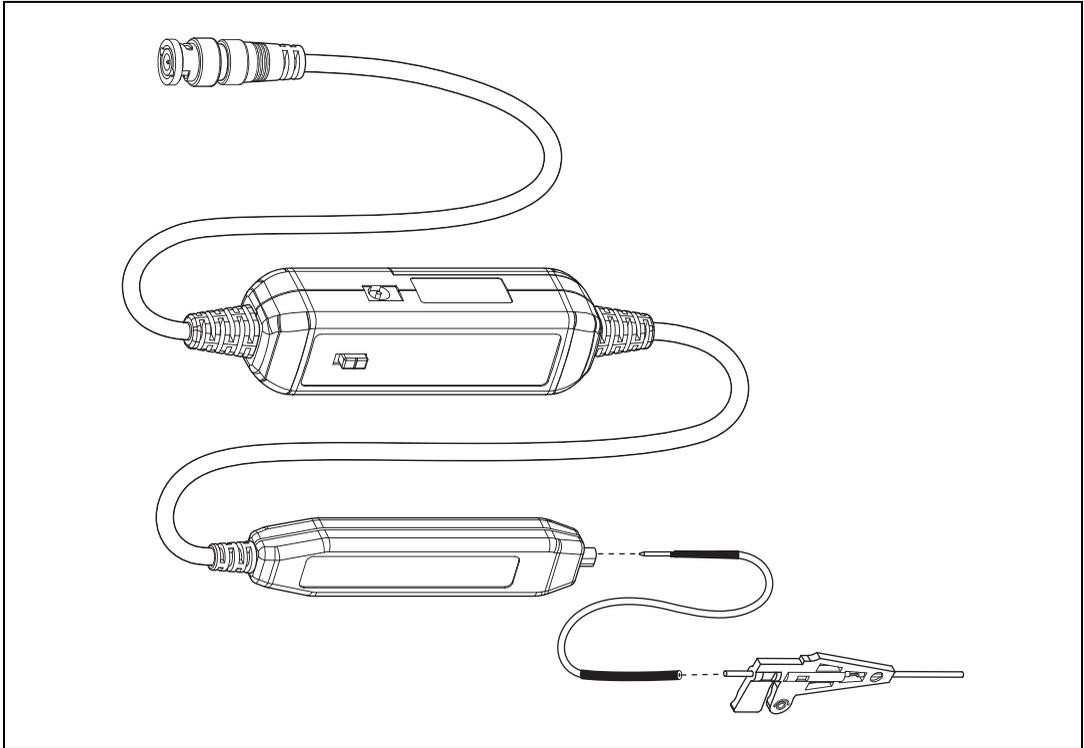


Figure 3. Connecting Micro Test Clip to the NI 5191

- Connect the pincer clip to the extension leads through a small pin located on either side of the back of the clip, as shown in Figure 4.

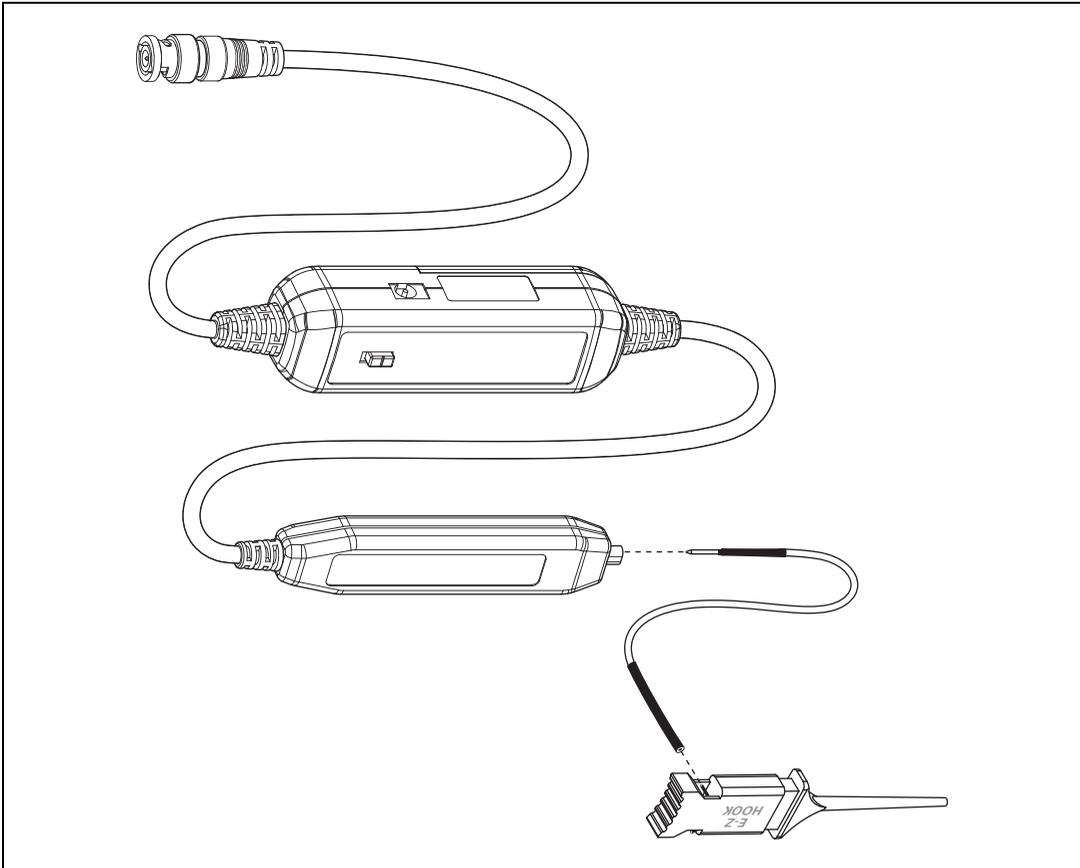


Figure 4. Connecting a Pincer Clip to the NI 5191

General Safety Information

Review the following safety precautions to avoid injury and prevent damage to this probe or any instruments connected to it.



Caution Observe maximum working voltage—To avoid injury, do not use the probe if the voltage between either input lead or earth ground is above 30 Vrms CAT I. Also be sure to observe any voltage limitations of the connected measurement instrument, which may be less than the probe.



Caution Ground the probe—The NI 5191 is grounded with the shell of the BNC connector through the grounding conductor of the attached measurement instrument. Before making connections to the input leads of the probe, ensure that the output BNC connector is attached to the input connector of the measurement instrument.



Caution The measurement instrument must be properly grounded.



Caution Do *not* operate without covers—To avoid electrical shock or fire hazard, do not operate the NI 5191 with covers removed.



Caution Do *not* operate in wet/damp conditions—To avoid electrical shock, do not operate the NI 5191 in wet or damp conditions.



Caution Do *not* operate in explosive atmosphere—To avoid injury or fire hazard, do not operate the NI 5191 in an explosive atmosphere.



Caution Avoid exposed circuitry—To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.



Caution Use proper power source—To ensure the proper function of the probe, use one 9V battery or the provided USB power cable.



Caution Do *not* operate with suspected failures—If you suspect there is damage to the probe, have it inspected by qualified service personnel.

Specifications

Typical values listed in this document are representative of an average unit operating at room temperature. The probe and connected measurement instrument should be warmed up for at least 20 minutes prior to use. Specifications are subject to change without notice. For the most recent NI 5191 specifications, visit ni.com/manuals.

Typical specifications are unwarranted values that are representative of a majority (90%) of units within certain operating conditions and include the effects of temperature and uncertainty unless otherwise noted.

Electrical Specifications

All specifications are typical.

Table 1. NI 5191 Electrical Specifications

Specification	Value	Comment
Bandwidth (–3 dB)	800 MHz	Dual-Signal Pin Configuration
Attenuation Ratio	10:1	—
Input Impedance	100 k Ω 2 pF	Either input to ground
Gain Accuracy	$\pm 2\%$	—
Differential Input Voltage	± 15 V	DC + Peak AC
Common-Mode Input Voltage	± 30 V	DC + Peak AC
Absolute Maximum Rated Input Voltage	± 40 V	DC + Peak AC. Either input to ground
Single-Ended Output Voltage	± 1.5 V	Into 50 Ω load
Output Impedance	50 Ω	—
Offset	± 5 mV	—
Common-Mode Rejection Ratio (CMRR)	–60 dB at 60 Hz –15 dB at 500 MHz	—

Derating Curve

NI 5191 typical derating curve of absolute maximum input voltage (either input to ground).

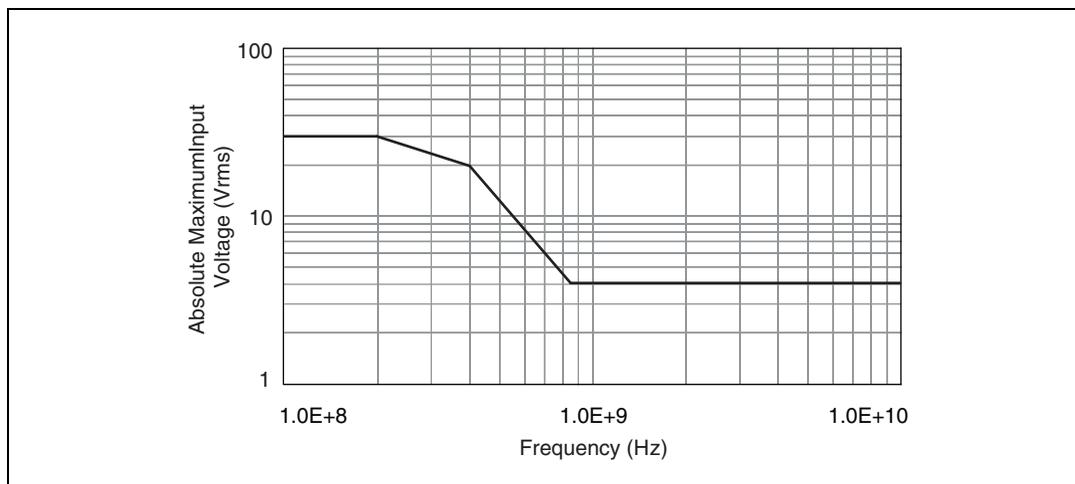


Figure 5. NI 5191 Derating Curve

Power Requirements

Table 2. NI 5191 Power Requirements

Specification	Value
Power supply input range	5 V (500 mA) to 9 V (300 mA)
Required power sources	One 9 V alkaline battery or supplied USB power cable



Note NI recommends using only the power sources included in the kit. If you use another power supply, it must meet the input range requirements and it must be a UL Listed ITE power supply marked LPS. Power supply must also meet product safety requirements for the country of use.

Physical Specifications



Note If you need to clean the NI 5191, use a soft dry cloth. Avoid immersing the probe and using abrasive cleaners or chemicals containing benzene or similar solvents.

Table 3. NI 5191 Physical Specifications

Specification	Value	Comment
Approximate weight	150 g (5.3 oz)	Not including battery or attached accessories
Output BNC cable length	120 cm (47.3 in.)	—
Probe main body dimensions	111 mm × 22 mm × 14 mm (4.4 in. × 0.9 in. × 0.6 in.)	—
USB power cable length	2 m (78.7 in.)	—

Environmental



Note The NI 5191 is intended for indoor use only.

Table 4. NI 5191 Environmental Specifications

Specification	Value
Operating Temperature	-10 °C to +40 °C
Storage Temperature	-30 °C to +70 °C
Operating Relative Humidity	25% to 85%, noncondensing
Storage Relative Humidity	25% to 85%, noncondensing

Compliance and Certifications

Safety

This product meets the requirements of the following standards of safety for hand-held probe assemblies for electrical measurement and test:

- IEC 61010-031
- EN 61010-031



Note For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

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



Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generates radio frequency energy for the treatment of material or inspection/analysis purposes.



Note For EMC declarations and certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance

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)

Online Product Certification

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

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 to the environment and 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

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

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, visit the Worldwide Offices section of ni.com/niglobal to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

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