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# USB-5133 Specifications

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## Definitions



**Caution** The protection provided by the USB-5133 can be impaired if it is used in a manner not described in this document.

**Warranted** specifications describe the performance of a model under stated operating conditions and are covered by the model warranty. **Warranted** specifications account for measurement uncertainties, temperature drift, and aging. **Warranted** specifications are ensured by design, or verified during production and calibration.

The following characteristic specifications describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty:

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.
- **Measured** specifications describe the measured performance of a representative model.

Specifications in this document are **Typical** unless otherwise noted.

## Conditions

Specifications are valid under the following conditions unless otherwise noted:

- Full bandwidth
- The Sample Clock is set to full rate.
- The module is warmed up for 10 minutes at ambient temperature.

- Self-calibration is completed after warm-up period.
- Calibration cycle is maintained.

## Vertical

### Analog Input

Number of channels	2, simultaneously sampled
Connector	BNC

### Impedance and Coupling

Input impedance	1 M $\Omega$ $\pm$ 1% in parallel with a nominal capacitance of 19 pF
Input coupling	AC, DC, GND

### Voltage Levels

Range (V <sub>pk-pk</sub> )	Vertical Offset Range (V) <sup>[1]</sup>
0.04	$\pm$ 0.4
0.1	$\pm$ 0.4
0.2	$\pm$ 0.4
0.4	$\pm$ 0.4
1.0	$\pm$ 4.0
2.0	$\pm$ 4.0
4.0	$\pm$ 4.0
10	$\pm$ 25.0
20	$\pm$ 20.0
40	$\pm$ 10.0

Table 1. Full Scale (FS) Input Range and Programmable Vertical Offset

Maximum input overload	$ Peaks  \leq 30\text{ V}$
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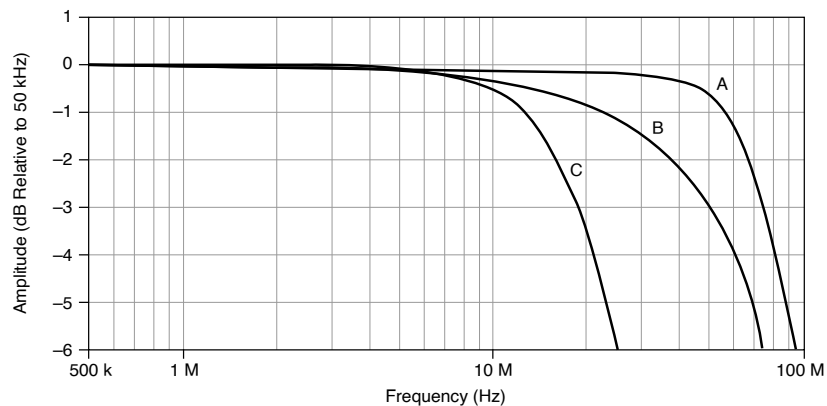
## Accuracy

Resolution	8 bits
Accuracy <sup>[2]</sup>	$\pm(2\% \text{ of input} + 1\% \text{ FS} + 300\ \mu\text{V})$ , warranted
DC drift	$\pm(0.033\% \text{ of input} + 0.06\% \text{ of FS} + 40\ \mu\text{V})$ per °C, nominal
AC coupling cutoff (-3 dB)	12 Hz

## Bandwidth and Transient Response

<b>Bandwidth<sup>[3],[4]</sup> (-3 dB)</b>	
All ranges except 0.04 $V_{pk-pk}$ range	50 MHz, warranted
0.04 $V_{pk-pk}$ range	35 MHz, warranted
Bandwidth limit filter	20 MHz noise filter

Figure 1. Frequency Response, Measured

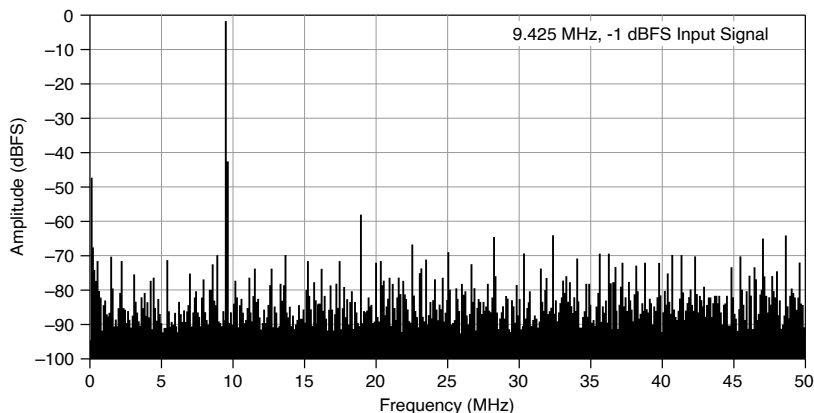


A	Frequency response at full bandwidth, all ranges except 40 mV <sub>pk-pk</sub> range, measured
B	Frequency response at full bandwidth, 40 mV <sub>pk-pk</sub> range, measured
C	Frequency response with 20 MHz noise filter, all ranges, measured

## Spectral Characteristics

<b>RMS noise</b>	
All ranges except 0.04 V <sub>pk-pk</sub> range	0.35% FS
0.04 V <sub>pk-pk</sub> range	0.55% FS

Figure 2. USB-5133 Dynamic Performance, 1 V<sub>pk-pk</sub> Range, 524,288-Point FFT, Measured



## Horizontal

### Sample Clock

### Onboard Clock

Sample rate range, real-time sampling (single shot) <sup>[5]</sup>	1.526 kS/s to 100 MS/s
Timebase frequency	100 MHz

Timebase accuracy	±50 ppm
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#### Related information

- [Fore more information about Sample Clock and decimation, refer to the NI High-Speed Digitizers Help.](#)

#### External Sample Clock<sup>[6]</sup>

Sources	PFI 1
Frequency range	1 MHz to 100 MHz
Duty cycle tolerance	45% to 55%

#### Related reference

- [PFI 1 \(Programmable Function Interface\)](#)

#### Trigger

#### Reference (Stop) Trigger

Types	Sources
Edge, window, hysteresis	CH 0, CH 1
Digital	PFI 1
Immediate, software	—

Table 2. Trigger Types and Sources<sup>[7]</sup>

#### Analog Trigger (Edge, Window, and Hysteresis Trigger Types)

Sources	CH 0 (front panel BNC connector), CH 1 (front panel BNC connector)
Trigger level resolution	8 bits

Trigger level range	Same as input signal
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## Digital Trigger (Digital Trigger Type)

Sources	PFI 1
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## Start Trigger

Types	Sources
Digital	PFI 1
Immediate and Software	—

Table 3. Trigger Types and Sources<sup>[8]</sup>

## Digital Trigger (Digital Trigger Type)

Sources	PFI 1
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## PFI 1 (Programmable Function Interface)

Connector	BNC
Direction	Bidirectional

## As an Input (Trigger)

Destinations	Start Trigger, Reference Trigger, External Sample Clock
Input impedance	1 M $\Omega$ , nominal



$V_{IH}$	2.4 V
$V_{IL}$	400 mV
Maximum input overload	-0.5 V to 3.5 V
Minimum pulse width	20 ns

## As an Output (Event)

Sources	Ready for Start, Ready for Reference, End of Acquisition (Done)
Output impedance	50 $\Omega$
Logic type	3.3 V CMOS
Maximum drive current	20 mA
Minimum pulse width	100 ns

## Waveform Specifications

Onboard memory size	4 MB per channel option or 32 MB per channel option
Minimum record length	1 Sample
Number of pretrigger samples	4 MB – posttrigger samples or 32 MB – posttrigger samples
Number of posttrigger samples	4 MB – pretrigger samples or 32 MB – pretrigger samples

## Calibration

Self-calibration	Self-calibration is done on software command. The calibration corrects for offset.
External calibration (factory calibration)	The external calibration calibrates the gain, the 1 M $\Omega$ attenuator, and the programmable vertical offset accuracy. Appropriate constants are stored in nonvolatile memory.
Interval for external calibration	2 years
Warm-up time <sup>[9]</sup>	10 minutes

## Power

+5 V DC	230 mA
Total power	1.15 W

## Software

### Driver Software

Driver support for this device was first available in NI-SCOPE14.1.

NI-SCOPE is an IVI-compliant driver that allows you to configure, control, and calibrate the USB-5133. NI-SCOPE provides application programming interfaces for many development environments.

### Application Software

NI-SCOPE provides programming interfaces, documentation, and examples for the following application development environments:

- LabVIEW
- LabWindows™/CVI™
- Measurement Studio
- Microsoft Visual C/C++
- .NET (C# and VB.NET)

#### Related information

- [For NI-SCOPE .NET support, visit ni.com.](http://ni.com)

## Interactive Soft Front Panel and Configuration

When you install NI-SCOPE on a 64-bit system, you can monitor, control, and record measurements from the USB-5133 using InstrumentStudio.

InstrumentStudio is a software-based front panel application that allows you to perform interactive measurements on several different device types in a single program.



**Note** InstrumentStudio is supported only on 64-bit systems. If you are using a 32-bit system, use the NI-SCOPE-specific soft front panel instead of InstrumentStudio.

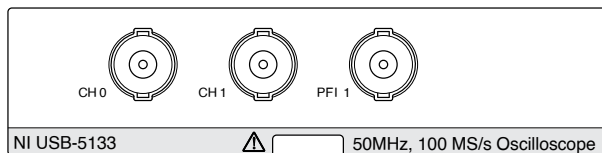
Interactive control of the USB-5133 was first available via InstrumentStudio in NI-SCOPE18.1 and via the NI-SCOPE SFP in NI-SCOPE3.5. InstrumentStudio and the NI-SCOPE SFP are included on the NI-SCOPE media.

NI Measurement & Automation Explorer (MAX) also provides interactive configuration and test tools for the USB-5133. MAX is included on the driver media.

## Physical

### Front Panel

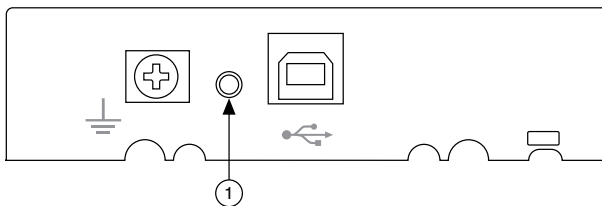
Figure 1. USB-5133 Front Panel



Connector	Function	Connector Type
CH 0	Analog input	BNC female
CH 1	Analog input	BNC female
PFI 1	Digital input/output/clk in	BNC female

### Back Panel

Figure 4. USB-5133 Back Panel



Indicator	Function	Indicator Type
1	Indicates that the device has power and has been recognized by the system	LED

### Cleaning Statement



**Notice** Clean the hardware with a soft, nonmetallic brush. Make sure that the hardware is completely dry and free from contaminants before returning it to service.

## Dimensions and Weight

Dimensions	18.49 × 3.38 × 10.29 cm  (7.279 × 1.314 × 4.053 in.)
Weight	244 g (8.6 oz)

## Environment

Maximum altitude	2,000 m (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

## Operating Environment

Ambient temperature range	0 °C to 45 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)

## Storage Environment

Ambient temperature range	-20 °C to 70 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)

## Compliance and Certifications

### Safety Compliance Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1



**Note** For safety certifications, refer to the product label or the [Product Certifications and Declarations](#) 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 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



**Note** In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.



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



Note For EMC declarations, certifications, and additional information, refer to the [Product Certifications and Declarations](#) section.

## CE Compliance

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

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU; Restriction of Hazardous Substances (RoHS)

## Product Certifications and Declarations


Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit [ni.com/product-certifications](http://ni.com/product-certifications), search by model number, and click the appropriate link.

## 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 **Engineering a Healthy Planet** web page at [ni.com/environment](http://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.

## EU and UK Customers

-  Waste Electrical and Electronic Equipment (WEEE)—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations.

For more information about how to recycle NI products in your region, visit [ni.com/environment/weee](https://ni.com/environment/weee).

## 电子信息产品污染控制管理办法 ( 中国 RoHS )

-    中国 RoHS— NI 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 NI 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](https://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](https://ni.com/environment/rohs_china).)

<sup>1</sup> Programmable Vertical Offset Accuracy:  $\pm 2$  mV on 40 mV range,  $\pm 2.5\%$  on all other ranges, warranted

<sup>2</sup> Within 5 °C of self-calibration temperature.

<sup>3</sup> Filter off.

<sup>4</sup> Normalized to 50 kHz

<sup>5</sup> Divide by **n** decimation used for all rates less than maximum speed.

<sup>6</sup> Input must meet 3.3 V CMOS Logic requirements.

<sup>7</sup> If a digital trigger is being supplied through the PFI line, an external clock cannot be used.

<sup>8</sup> If a digital trigger is being supplied through the PFI line, an external clock cannot be used.

<sup>9</sup> Warm-up begins after the NI-SCOPE driver is loaded.