



APEX WAVES VB-8054 VirtualBench 4-Channel 500 MHz Bandwidth Oscilloscope User Guide

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This document includes compliance precautions and connection information for the VB-8054.



Note The guidelines in this document are specific to the VB-8054.

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Safety Guidelines

The following section contains important safety information that you must follow when installing and using the VB-8054.

Do not operate the hardware in a manner not specified in this document and in the user documentation. Misuse of the hardware can result in a hazard. You can compromise the safety protection if the hardware is damaged in any way. If the hardware is damaged, return it to National Instruments for repair.



Hazardous Voltage This icon denotes a warning advising you to take precautions to avoid electrical shock.



Caution Do not operate the VB-8054 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to National Instruments for repair.

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.

Do not substitute parts or modify the hardware except as described in the NI VirtualBench Help. Use the hardware only with the accessories and cables specified in the NI VirtualBench Help or NI VirtualBench VB-8054 Specifications.

Do not operate the hardware in an explosive atmosphere or where there may be flammable gases or fumes.

You must insulate signal connections for the maximum voltage for which the hardware is rated. Do not exceed the maximum ratings for the hardware. Do not install wiring while the hardware is live with electrical signals. Do not remove or add connector blocks when power is connected to the system. Avoid contact between your body and the connector pins when hot-swapping hardware. Remove power from signal lines before connecting them to or disconnecting them from the hardware.

Operate the device 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 that becomes conductive due to condensation.

Operate the DMM on the device at or below Measurement Category II1 . Operate the mixed signal oscilloscope, function generator (FGEN), external trigger (TRIG), digital I/O, and DC power supply on the device at or below Measurement Category I. Measurement circuits are subjected to working voltages² and transient stresses (overvoltage) from the circuit to which they are connected during measurement or test. Measurement categories establish standard impulse withstand voltage levels that commonly occur in electrical distribution systems. The following is a description of measurement categories:

- Measurement Categories CAT I and CAT O (Other) are equivalent and are for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS³ voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.
- Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local level electrical distribution, such as that provided by a standard wall outlet (for example, 115 V for U.S. or 230 V for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar E Series devices.
- Measurement Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hardwired 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.
- Measurement 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.

To obtain the safety certification(s) for this product, visit 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.

1. Measurement Category is defined in electrical safety standard IEC 61010-1. Measurement Category is also referred to as Installation Category.
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.

DMM Isolation Voltages



Hazardous Voltage This icon denotes a warning advising you to take precautions to avoid electrical shock.

Channel-to-earth ground

- **Continuous:** 300 V, Measurement Category II
- **Withstand:** 3,000 V RMS, verified by a 5 s dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.



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

DC Power Supply Isolation Voltages

- **+25 V and -25 V-to-earth ground, continuous:** 60 V DC, Measurement Category I



Note Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Power Requirements



Caution The protection provided by the VirtualBench hardware can be impaired if it is used in a manner not described in the NI VirtualBench VB-8054 Safety, Environmental, and Regulatory Information.

- **Voltage input range:** 100 V AC to 240 V AC, 50/60 Hz
- **Power consumption:** 150 W maximum
- **Power input connector:** IEC C13 power connector
- **Power disconnect:** The AC power cable provides main power disconnect. Do not position the equipment so that it is difficult to disconnect the power cable. Depressing the front panel power button does not inhibit the internal power supply

Preparing the Environment

Ensure that the environment you are using the VB-8054 in meets the following specifications.

- **Operating temperature** 0 °C to 40 °C
- **Cooling** Forced air circulation (negative pressurization) through a fan. Fan speed automatically adjusts according to operating conditions. Intake locations are on the sides of device. Exhaust location is on the rear of device. Ensure that the intake and exhaust locations are not obstructed.
- **Pollution Degree** 2

- **Maximum altitude** 2,000 m

Indoor use only.



Note Refer to the NI VirtualBench VB-8054 Specifications for complete specifications.

Electromagnetic Compatibility Guidelines

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

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent 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.



Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories connected to the Ethernet, USB, FGEN, TRIG, and oscilloscope CH 1 through 4 ports.

Connecting to the VB-8054

Connecting to the Mixed Signal Oscilloscope



Caution Exceeding the maximum input voltage ratings, which are listed in the NI VirtualBench VB-8054 Specifications, can damage the device and the computer. National Instruments is not liable for any damage resulting from such signal connections.

Connecting to the Function Generator (FGEN)

The FGEN BNC connector is the analog waveform output terminal from which standard functions and arbitrary waveforms are generated. The maximum output levels from this connector depend on the type of load termination.

Caution Exceeding the maximum output ratings, which are listed in the NI VirtualBench VB-8054 Specifications, can damage the device and the computer. National Instruments is not liable for any damage resulting from such signal connections.

Connecting to the External Trigger (TRIG)



Caution Exceeding the maximum input voltage ratings or maximum output ratings, which are listed in the NI VirtualBench VB-8054 Specifications, can damage the device and the computer. National Instruments is not liable for any damage resulting from such signal connections.

Connecting to the Digital I/O



Caution Exceeding the maximum input voltage ratings or maximum output ratings, which are listed in the NI VirtualBench VB-8054 Specifications, can damage the device and the computer. National Instruments is not liable for any damage resulting from such signal connections.



Caution Never connect the +3.3 V power terminal to analog or digital ground or to any other voltage source on VirtualBench or any other device. Doing so can damage the device and the computer. NI is not liable for damage resulting from such a connection.

Digital I/O

- **Type** 1, pluggable screw terminal, 3.5 mm (14 position)
- **Screw terminal wiring:** 0.1 mm² to 2.0 mm² (30 AWG to 14 AWG)
- **Torque:** 0.25 N · m (2.2 lb · in.)

Connecting to the DC Power Supply



Caution Exceeding the maximum output ratings, which are listed in the NI VirtualBench VB-8054 Specifications, can damage the device and the computer. National Instruments is not liable for any damage resulting from such signal connections.



Caution Do not exceed 60 V DC from any terminal to ground when cascading power supplies.



Caution The VB-8054 DC power supply does not provide isolation when using the +6 V channel.

Connecting to the DMM



Caution Exceeding the maximum input voltage ratings, which are listed in the NI VirtualBench VB-8054 Specifications, can damage the device and the computer. National Instruments is not liable for any damage resulting from such signal connections.

Where to Go Next

The following documents contain information that you may find helpful as you use this document:

- NI VirtualBench VB-8034/8054 Quick Start, packaged with your NI VirtualBench all-in-one instrument, describes how to install and configure NI VirtualBench and confirm it is operating properly.
- NI VirtualBench Help, which can be launched from NI VirtualBench app by clicking the ? icon, contains complete information about using your VirtualBench hardware and application.
- NI VirtualBench VB-8054 Specifications, found on ni.com/manuals, lists the specifications for your VirtualBench.

Worldwide Support and Services

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

COMPREHENSIVE SERVICES

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Documents / Resources

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References

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- [NI Engineer Ambitiously - NI](#)
- [NI Product Certifications - NI](#)
- [NI Product Documentation - NI](#)
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