

CALIBRATING THE NI 5112 WITH CALIBRATION EXECUTIVE

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Introduction

This document contains information and step-by-step instructions for loading and running the calibration procedure for the NI 5112 using National Instruments Calibration Executive.

What Is Calibration?

Calibration consists of verifying the measurement accuracy of a device and correcting for any measurement error. *Verification* is measuring the performance of a device and comparing the results to the factory specifications of the device. NI calibrates every 5112 digitizer at the factory. During the factory calibration process, the calibration constants are stored on the EEPROM. These values are loaded from memory and used as needed by the digitizer.

Why Should You Calibrate?

The accuracy of electronic components drifts with time and temperature, which can affect measurement accuracy as the device ages. Calibration restores your digitizer to its specified accuracy and ensures that it still meets NI standards.

How Often Should You Calibrate?

The measurement accuracy requirements of your application determine how often you should externally calibrate your NI 5112 digitizer. NI recommends that you perform a complete calibration at least once every year. You can shorten this interval to 90 days or six months based on the demands of your application.

You can also use the verification procedure at a regular interval to determine if your oscilloscope needs adjustment.

Equipment and Other Test Requirements

This section describes the equipment, documentation, software, and test conditions needed for calibration.

Test Equipment

Tables 1 and 2 list specifications for equipment you can use to calibrate your NI 5112 with Calibration Executive.

Recommended Equipment

Table 1 lists the equipment that NI recommends for this procedure.

Table 1. Recommended Equipment Specifications for NI 5112 Calibration

Required Equipment	Recommended Equipment	Parameter Measured	Necessary Specifications
Scope Calibrator	Wavetek 9500 Scope Calibrator	Vertical Offset	0 VDC \pm 0.1 mV
		Vertical Gain	DC \pm 25 mV to \pm 22.5 V, \pm 0.25% into 1 M Ω
		AC Coupling	sine wave 9–13 Hz \pm 100 ppm, 1.8 V _{pp} \pm 2% into 1 M Ω
		Bandwidth	\pm 2% amplitude flatness for leveled sine wave 100 kHz–100 MHz \pm 50 ppm, 1.5 V _{pp} \pm 2% into 50 Ω
		Input Impedance	2 wire resistance accuracy of 0.25% for 50 Ω and 1 M Ω measurements
		Timing/RIS	sine wave 10 kHz–10 MHz \pm 15 ppm, 1.8 V _{pp} \pm 2% into 1 M Ω
		Trigger Sensitivity	sine wave 100 kHz–10 MHz \pm 100 ppm, 300 mV _{pp} \pm 2% into 1 M Ω
Active Head	Wavetek 9510 Active Head or better	—	—

If you do not have the recommended instruments, use the accuracy requirements listed above to select a substitute calibration standard. Refer to Table 2 for a list of alternative instruments you can use for the calibration procedure. Although these instruments are acceptable, NI recommends that you use the instruments from Table 1.

Alternative Equipment

Table 2 contains a list of alternative equipment you can use to calibrate your NI 5112 with Calibration Executive.

Table 2. Alternative Equipment Specifications for NI 5112 Calibration

Required Equipment	Recommended Equipment	Parameter Measured	Necessary Specifications
Calibrator	Fluke 5700 Calibrator	Vertical Offset	0 VDC \pm 0.1 mV
		Vertical Gain	DC \pm 25 mV to \pm 22.5 V, \pm 0.25% into 1 M Ω
		AC Coupling	sine wave 9–13 Hz \pm 100 ppm, 1.8 Vpp \pm 2% into 1 M Ω
Function Generator	Tegam SG 5030	Bandwidth	\pm 2% amplitude flatness for leveled sine wave 100 kHz–100 MHz \pm 50 ppm, 1.5 Vpp \pm 2% into 50 Ω
		Timing/RIS	sine wave 10 kHz–10 MHz \pm 15 ppm, 1.8 Vpp \pm 2% into 1 M Ω
		Trigger Sensitivity	sine wave 100 kHz–10 MHz \pm 100 ppm, 300 mVpp \pm 2% into 1 M Ω
DMM	HP 34401	Input Impedance	2 wire resistance accuracy of 0.25% for 50 Ω and 1 M Ω measurements
		Internal Reference	DC voltage accuracy of \pm 0.25% (\pm 12.5 mV) when measuring \pm 5 V
BNC Cable	—	—	50 Ω
BNC terminator	—	—	50 Ω
BNC T connector	—	—	—

Documentation

This section describes the documentation you need to calibrate your 5112 digitizer. In addition to this calibration procedure, you may need to refer to the following documents:

- *NI-SCOPE Quick Reference Guide*
- *Where to Start with Your NI Digitizer*
- *NI 5112 User Manual*
- *NI-SCOPE Software User Manual*

You can download these documents from the NI Web site at ni.com/manuals.

Software

Complete the following steps to install the calibration procedure for high-speed digitizers:

1. Make sure that your computer and monitor are powered on and that you have installed Windows 2000/NT/Me/9x.
2. Close all open applications.
3. Insert the installation CD into the CD-ROM drive.
4. Choose the **Run** option from the **Start** menu on the desktop task bar.
5. In the command line box, type `x:\setup.exe` (where *x* is the letter of the CD-ROM drive you are using), and click **OK**.
6. Follow the instructions that appear in the dialog boxes.

The setup program installs Calibration Executive as well as the associated files listed in Table 3.

Table 3. Calibration Executive Directories and Supporting Files

Directory Name	Contents
Calibration Executive\Procedures\ NI 5112\Limits	Microsoft Access database that stores the calibration limits
Calibration Executive\Procedures\ NI 5112	Directory structure that contains the calibration procedures

Test Conditions

Follow these guidelines to optimize the connections and the environment during calibration:

- Keep connections to the NI 5112 short. Long cables and wires act as antennae, picking up extra noise that can affect measurements.
- Use a 50 Ω BNC coaxial cable for all connections to the digitizer if you are not using a Wavetek 9500 calibrator.
- Keep relative humidity between 10 and 90%, noncondensing, or consult your digitizer hardware manual for the optimum relative humidity.
- Maintain the temperature between 25 and 35 °C.
- Allow a warm-up time of at least 15 minutes to ensure that the measurement circuitry of the 5112 is at a stable operating temperature.

Calibration Procedures

This section explains how to set up and run the Calibration Executive procedure.

Using the Wavetek 9500 in automated mode, the calibration procedure takes approximately 15 minutes. In manual mode, the procedure takes approximately 40 minutes.

Using the alternative instruments in automated mode, the calibration procedure takes approximately 30 minutes. In manual mode, the procedure takes approximately 50 minutes.

Connecting Your Calibrator, DMM, and NI 5112

The calibration procedure steps you through the connections between the calibrator, function generator, DMM, and NI 5112.

Running the Calibration Executive Procedure

To run the Calibration Executive calibration procedure, complete the following steps:

1. Launch Calibration Executive and follow the Calibration Configuration Wizard to load the NI 5112 calibration procedure. Refer to Chapter 1, *Introduction to Calibration Executive*, in the *Calibration Executive Software User Manual* if you need more information on configuring and loading a calibration procedure.
2. When prompted by Calibration Executive, enter information about the installed hardware, such as the calibrator and the function generator.



Note If you are using the Wavetek 9500, you do not need a function generator or a DMM, so you can leave `none` selected in the list boxes for **Selected Generator Information**, and **Available Address**. You must also enter `N/A` in the appropriate fields for the tracking numbers and calibration due dates before you can proceed. The calibration report does not include any of this extra information.



Note If you are using the alternative equipment, leave `none` selected in the list box for **Scope Calibrator**. You must also enter `N/A` in the appropriate fields for the tracking numbers and calibration due dates before you can proceed.

3. When the procedure is loaded, click **Run Procedure** to begin. The procedure prompts you to enter the device number, which is the number assigned by Measurement & Automation Explorer (MAX).
4. Follow any instructions you receive from Calibration Executive.

Viewing the Calibration Report

When the procedure is finished, complete the following steps to view the calibration report:

1. Click **View»Reports**.
2. Select **View** to launch your browser and view your report. The calibration report appears as a printable HTML file.

You have completed calibrating your NI 5112 with Calibration Executive.



Note If your NI 5112 digitizer fails after calibration, return it to NI for repair or replacement.

Technical Support Resources

NI Web Support

NI Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of ni.com.

Worldwide Support

NI has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of ni.com. Branch office Web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or NI corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 03 9879 5166, Austria 0662 45 79 90 0, Belgium 02 757 00 20,
Brazil 011 284 5011, Canada (Calgary) 403 274 9391,
Canada (Montreal) 514 288 5722, Canada (Ottawa) 613 233 5949,
Canada (Québec) 514 694 8521, Canada (Toronto) 905 785 0085,
China (Shanghai) 021 6555 7838, China (ShenZhen) 0755 3904939,
Denmark 45 76 26 00, Finland 09 725 725 11, France 01 48 14 24 24,
Germany 089 741 31 30, Greece 30 1 42 96 427, Hong Kong 2645 3186,
India 91805275406, Israel 03 6120092, Italy 02 413091,
Japan 03 5472 2970, Korea 02 596 7456, Malaysia 603 9596711,
Mexico 5 280 7625, Netherlands 0348 433466,
New Zealand 09 914 0488, Norway 32 27 73 00, Poland 0 22 528 94 06,
Portugal 351 1 726 9011, Singapore 2265886, Spain 91 640 0085,
Sweden 08 587 895 00, Switzerland 056 200 51 51,
Taiwan 02 2528 7227, United Kingdom 01635 523545



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