CALIBRATING NI 4050/4060 DMMS WITH CALIBRATION EXECUTIVE

Contents

Introduction

This document contains information and step-by-step instructions for loading and running the National Instruments Calibration Executive procedure for NI 4050/4060 digital multimeters (DMMs).

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 NI 4050/4060 DMM 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 device.

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 device 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 calibrate an NI 4050/4060 DMM. 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 the NI 4050/4060 needs adjustment.

Equipment and Other Test Requirements

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

Test Equipment

To calibrate an NI 4050/4060 DMM, you need a calibrator. The calibration procedure runs in automated mode if you use a calibrator that is supported by IVI. NI recommends the Fluke 5700A.

If you do not have a calibrator supported by IVI, use a calibrator that is 4 times as accurate as the analog-to-digital converter (ADC) on the device—at least 10 ppm (0.001%) accurate for DC voltage specifications.

Connectors

Although you can perform the calibration procedure without any special connectors, connecting and disconnecting are easier with the correct equipment. The automated calibration procedure for NI 4050/4060 DMMs is designed to work with banana connectors on the cables supplied with your calibrator.

For current measurements on the NI 4050, use an NI 4050 cable adapter and CSM-200 mA current shunt module, shown in Figure 1. Current verification is optional—refer to the *Running the Calibration Executive Procedure* section for more information.
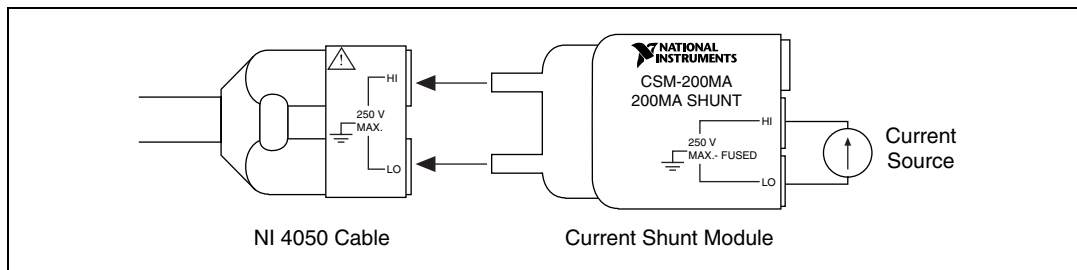

Figure 1. CSM-200 mA Current Shunt Module and NI 4050 Cable

Documentation

This section describes the documentation you need to calibrate your NI 4050/4060 DMM. In addition to this calibration procedure, you may need to refer to the following documents:

- *Calibration Executive Software User Manual*
- *NI 4050 User Manual* or *NI 4060 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 Executive procedure for the NI 4050/4060:

1. Make sure that your computer and monitor are powered on and that you have installed Windows 2000/NT/XP/Me/9*x*.

2. Close all open applications.

3. Insert the installation CD into the CD drive.

4. Select **Start»Run** from the Windows task bar.

5. In the command line box, enter `x:\setup.exe` (where *x* is the letter of the CD drive you are using), then 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 1.

Table 1. Calibration Executive Directories and Supporting Files

Directory Name	Contents
`Calibration Executive\Procedures\` `NI4050 NI4060`	Directory that contains the calibration procedures
`Calibration Executive\Procedures\` `NI4050 NI4060\Limits`	Directory that contains the calibration limit databases

Test Conditions

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

- Keep connections to the NI 4050/4060 short. Long cables and wires act as antennae, picking up extra noise that can affect measurements.
- Keep relative humidity between 10–90%, noncondensing, or consult your DMM hardware manual for the optimum relative humidity.
- Maintain the temperature between 25–35 °C.
- Allow a warm-up time of at least 15 minutes to ensure that the measurement circuitry of the DMM is at a stable operating temperature.

Calibration Temperatures

To account for temperature changes, the tested specifications include the effects of temperature drift. For NI 4050/4060 DMMs, the following temperature drifts are valid:

- 24-hour range: calibration temperature ±5 °C
- 1-year range: calibration temperature ±10 °C

Calibration Procedures

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

In automated mode, the calibration procedure takes approximately 1 hour. In manual mode, the calibration procedure can take up to 6 hours.

Note For an explanation of automated versus manual calibration, refer to the *Automated Versus Manual Calibration* section in Chapter 2, *Calibration Executive System Overview*, of your *Calibration Executive Software User Manual*.

Setting Up the NI 4050/4060 DMM for Calibration

To set up the NI 4050/4060 for calibration, complete the following steps:

1. Install the NI 4050/4060 in your computer.

2. Configure the hardware using Measurement & Automation Explorer (MAX). Refer to the *DAQ Quick Start Guide* for configuration information.

Running the Calibration Executive Procedure

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

1. Launch Calibration Executive and follow the Calibration Configuration Wizard to load the 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 the calibration procedure.

2. When prompted by Calibration Executive, enter the model, serial number, and calibration date of the calibrator you are using.

Note If you are calibrating an NI 4050, the Calibration Executive also presents the option to verify current measurements. Current verification is optional because the NI 4050 is dependent on the CSM-200 mA external current shunt module for current measurements. The NI 4050 measures voltage drop across the precision resistor within the CSM-200 mA, then translates that voltage into a current. If the NI 4050 fails current verification after you have calibrated for voltage measurements, try using another CSM-200 mA or another 1 Ω precision resistor.

3. 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. Select **View»Reports** from the main menu.

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

You have completed calibrating the NI 4050/4060 with Calibration Executive.

Note If your NI 4050/4060 DMM fails after calibration, try running the Calibration Executive procedure again. If it fails a second time, return the device to NI for repair or replacement.

Troubleshooting Guidelines

This section describes common problems you might encounter when calibrating an NI 4050/4060 and explains how to correct the problem.

If the NI 4050/4060 is not recognized in MAX, make sure that you followed the configuration guidelines. Additional configuration information is available at ni.com/support/daq. If MAX fails to recognize the NI 4050/4060 after you reconfigure, contact NI technical support.

If the NI 4050/4060 fails after calibration, try the following:

1. Check the connections and run the Calibration Executive procedure again.

2. If the calibration still fails after trying step 1, try inputting or outputting the failed test points using the Test Panel in MAX or the NI-DMM Soft Front Panel. For example, if the analog input (AI) failed at 1.99 VDC, input that value from the calibrator.

   a. Launch the test panel in MAX.

   b. Set the **Input Limits** to ±2.00 V and set the **Data Mode** to DC voltage.

   c. Check the Average Reading indicator.

If the Average Reading falls outside the range of limits shown in the calibration report after you complete steps 1 and 2, contact NI for repair or replacement. If the Average Reading falls within the limits, you can change the calibration report to indicate the passing value.

Note If you have Microsoft Access 2000 or later installed on your computer, you can also modify the database containing the test results. By default, this database is located in \Calibration Executive\Databases\Calibration Reports.mdb.

NI-DAQ Errors and Other Errors

This section describes some of the common errors that can occur when calibrating an NI 4050/4060.

The error **Could not find ividmm.dll** is caused by a problem with the original installation of Calibration Executive. If you see this error when you launch the calibration procedure, complete the following steps:

1. Navigate to \Program Files\National Instruments\ Calibration Executive\TestStand\Cfg.

2. Using a text editor, look at the testexec.ini file. The entry under the config.searchdirectories should be as listed in Table 2.

Table 2. Paths to the testexec.ini File

Operating System	Path
Windows Me/98/95	[Config.SearchDirectories[11]] Path= "c:\\VXIpnp\\Win95\\Bin"
Windows 2000/NT/XP	[Config.SearchDirectories[11]] Path= "c:\\VXIpnp\\WinNT\\Bin"

If the search path contains more than two backslashes between folders, the extra backslashes can cause the error. Remove the extra backslashes so that the search path matches the correct path from Table 2, then save testexec.ini and relaunch Calibration Executive.

Error code **-10005** indicates that the device number you selected is not configured or recognized in MAX. Configure the device in MAX and restart Calibration Executive.

Error code **-15** at the beginning of the calibration procedure indicates that the computer may be configured to use commas as decimal places. Calibration Executive only supports using periods (.) for decimal places. To change this configuration on the computer, complete the following steps:

1. Select **Start»Settings»Control Panel**.

2. If you are using Windows Me/9*x*, click **Regional Settings**. If you are using Windows 2000/NT/XP, click **Regional Options**.

3. Click the **Numbers** tab and change the Decimal Symbol from a comma (,) to a period (.). Change the Digit Grouping Symbol from (.) to (,).

Note If you change the Regional Settings or Regional Options on the computer, you may want to change them back to the default after running the Calibration Executive procedure.

You can find more information on other error codes in the *Status Codes* section of the *NI-DAQ Help* file. To find this file, select **Start»Programs»National Instruments»NI-Daq»NI-DAQ Help**.

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 3262 3599, 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, Czech Republic 02 2423 5774, 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 91 80 535 5406, Israel 03 6393737, Italy 02 413091, Japan 03 5472 2970, Korea 02 3451 3400, Malaysia 603 9596711, Mexico 001 800 010 0793, Netherlands 0348 433466, New Zealand 09 914 0488, Norway 32 27 73 00, Poland 0 22 528 94 06, Portugal 351 210 311 210, Russia 095 238 7139, Singapore 2265886, Slovenia 386 3 425 4200, South Africa 11 805 8197, Spain 91 640 0085, Sweden 08 587 895 00, Switzerland 056 200 51 51, Taiwan 02 2528 7227, United Kingdom 01635 523545