Calibrating NI 660*x* Devices with Calibration Executive

This document describes how to load and run the National Instruments Calibration Executive procedure for the following NI 660*x* counter/timer devices:

- NI 6601

- NI 6602

- NI 6608

Contents

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Conventions

This document uses the following conventions:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

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

bold   Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

italic   Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

`monospace`   Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

Equipment and Other Test Requirements

This section describes the equipment, test conditions, documentation, and software necessary to calibrate NI 660*x* counters using Calibration Executive.

Test Equipment

Use the following items to calibrate the NI 660*x* device:

- Highly stable 10 MHz clock source that is accurate to within 0.75 parts per billion (ppb) for the NI 6608, and accurate to within one ppm for the NI 6601/6602. NI recommends a rubidium frequency standard clock source.

Note Make sure the source outputs a 10 MHz TTL square wave.

- National Instruments SH68-68-D1 cable (part number 183432-01). You must use this cable to calibrate the NI 660*x* device.
- SCB-68 breakout box

Test Conditions

Use the following guidelines to optimize the connections and the environment during calibration:

- Keep connections short. Long cables and wires act as antennae, picking up extra noise that can affect measurements.

- Use shielded coaxial wire for all cable connections to the device.

- Maintain a temperature of 25 °C.

- Keep the relative humidity below 80%.

- Allow a warm-up time of at least 15 minutes to ensure that the measurement circuitry of the NI 660*x* device and the clock source are at a stable operating temperature.

Software

The setup program installs Calibration Executive, as well as the associated files listed in Table 1 and Table 2. These tables list the directory path and the contents of each file.

Table 1. Calibration Executive Directories and Supporting Files for the NI 6601 and NI 6602

Directory Name	Contents
`Program Files\National Instruments\ Calibration Executive\Procedures\ NI6601 NI6602`	Directory structure that contains the calibration procedure
`Program Files\National Instruments\ Calibration Executive\Procedures\ NI6601 NI6602\Limits`	Microsoft Access databases that store the calibration limits
`Program Files\National Instruments\ Calibration Executive\Procedures\ NI6601 NI6602\Support Files`	Support files, such as bitmaps and DLLs

Table 2. Calibration Executive Directories and Supporting Files for the NI 6608

Directory Name	Contents
`Program Files\National Instruments\ Calibration Executive\Procedures\ NI6608`	Directory structure that contains the calibration procedure
`Program Files\National Instruments\ Calibration Executive\Procedures\ NI6608\Limits`	Microsoft Access databases that store the calibration limits
`Program Files\National Instruments\ Calibration Executive\Procedures\ NI6608\Support Files`	Support files, such as bitmaps and DLLs

Documentation

The following documentation resources are available for download at `ni.com/manuals`:

- Hardware documentation for the NI 660*x* device
- *Calibration Executive Software User Manual*
- *DAQ Quick Start Guide*
- *NI-DAQ Function Reference Help*
- *NI-DAQ User Manual for PC Compatibles*

Before Getting Started

The verification procedure for NI 6601/6602 devices takes approximately one minute to complete. The calibration procedure for NI 6608 devices takes approximately two hours to complete.

For NI 6608 devices, the verification procedure takes approximately six minutes, and the adjustment procedure takes approximately 95 minutes. During this time, Calibration Executive is not accessible. To terminate the adjustment procedure, disconnect the source. Once terminated, the adjustment procedure will exit in 20 minutes or less.

Setting Up the PXI-6608 Device in MAX

For calibration, the PXI-6608 device must be in slot 2 of the PXI chassis. Complete the following steps to configure MAX to recognize the device as being in slot 2:

1. Expand the **Devices and Interfaces** branch of the MAX configuration tree. PXI system controllers that have not yet been configured appear as **PXI System (Unidentified)**. Right-click

PXI System (Unidentified), and select the appropriate controller model from the **Identify As** menu. For MXI-3 and MXI-4 controllers, select **External PC**.

2. Expand the **PXI System** controller to display a list of chassis.

3. To identify each chassis, right-click the chassis name, and select the appropriate chassis model from the **Identify As** menu.

4. Verify that MAX lists the PXI-6608 as being in slot 2.

Calibration Executive Procedures

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

Setting Up the NI 660*x* for Calibration

To set up the NI 6601/6602 device for calibration, you must connect it to a clock source.

Connecting the NI 6601/6602 to a Clock Source

Complete the following steps to connect the NI 6601/6602 to an alternative clock source:

1. Use the SH68-68-D1 cable to connect the NI 6601/6602 device to the 68-pin breakout box.

2. Using twisted-pair wires, connect the clock to source pins 7 and 41 on the 68-pin breakout box. Pin 7 corresponds to PFI_35, which is the SOURCE of counter 1 on all NI 6601/6602 devices. Pin 41 is the digital ground.

Connecting the NI 6608 to a Clock Source

Note   Before running the NI 6608 procedures, close all other programs, and verify that the PXI-6608 device is in slot 2 and that MAX is configured to recognize the device as being in slot 2. For information about configuring MAX, refer to the *Setting Up the PXI-6608 Device in MAX* section of this document.

Complete the following steps to connect the NI 6608 to an alternative clock source:

1. Use the SH68-68-D1 cable to connect the NI 6608 to the 68-pin breakout box.

2. Connect the clock source to pin 2 (PFI_39). PFI_39 is the SOURCE of counter 0 on the NI 6608.

3. Connect the ground of the clock source to pin 36.

Loading and Running the Calibration Executive Procedure

Complete the following steps to load and run the NI 660*x* Calibration Executive procedure:

1. Launch Calibration Executive.

2. Follow the Calibration Configuration Wizard to load the NI 660*x* calibration procedure.

Note For more information about loading and running the calibration procedure, refer to the *Calibration Executive Software User Manual*.

3. When prompted to enter information about the device, enter the device number Measurement & Automation Explorer (MAX) assigned to the counter.

4. When the correct procedure loads, click **Run Procedure**.

5. Follow the Calibration Executive instructions.

If the NI 6608 fails after calibration, refer to the *Troubleshooting* section of this document. If the NI 6608 fails after troubleshooting, return it to NI for repair or replacement.

NI 6601/6602 devices that fail verification cannot be adjusted and must be returned to National Instruments for repair or replacement.

Viewing the Calibration Report

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

1. Select **View»Reports**.

2. Click **View**.

Modifying the Font Size in a Calibration Report

If you selected an HTML format and the text size in the calibration report is too large, you can decrease the size as follows:

• In Internet Explorer, modify the text size by selecting **View»Text Size**.

• In Netscape, modify the text size by selecting **View»Decrease Font**.

Troubleshooting

This section describes how to correct NI 660*x* calibration problems.

Use the following troubleshooting guidelines if the NI 660*x* device fails after running the calibration procedure:

1. Verify that the clock source is a 10 MHz TTL signal.

2. Check that the device is properly connected, and run the Calibration Executive procedure again.

3. If the calibration fails after running the Calibration Procedure again, open the test panel in MAX and configure as follows:

    -   **Counter Mode**: Simple Event Counting
    -   **Counter**: GPCTR0
    -   **Event Source**: Counter Source Pin

An increasing Counter Value indicates that the device is connected properly. A counter value that does not change indicates that the signal is not connected or is not working.

If the NI 660*x* device fails after completing these steps, contact NI for repair or replacement.

✎ **Note** You can use Microsoft Access 2000 or later to modify the database containing the test results. By default, this database is located in \Calibration Executive\ Databases\Calibration Reports.mdb.

Errors

This section describes some of the errors that can occur when calibrating an NI 660*x* device.

Error Code –15

Error code **–15** occurs at the beginning of the calibration procedure if the computer is configured to use commas as decimal places. Calibration Executive only supports using periods for decimal places.

To correct this error, change the computer configuration. After running the Calibration Executive, change the computer configuration back to the default settings.

Windows 2000/NT/XP Users

To change the computer configuration in the Windows 2000/NT/XP operating system, complete the following steps:

1. Open the Control Panel.

2. Click **Date, Time, Language, and Regional Options**, and select **Regional and Language Options**.

3. Click **Customize**.

4. Change the **Decimal symbol** from a comma to a period, and change the **Digit grouping symbol** from a period to a comma.

Note After completing the calibration procedure, remember to change the computer configuration back to its original settings.

For more information about error codes, refer to the *Status Codes* section of the *NI-DAQ Function Reference Help*. To access this file, select **Start»Programs»National Instruments»NI-DAQ»Traditional NI-DAQ Function Reference Help**.

Specifications

The NI 660*x* data sheets are available for download at `ni.com/products`.

Specification information is available in the following documents:

- *NI 6601/6602 Specifications*
- Device specifications listed in *About Your 6608 Device Note to Users*
- *NI 6608 Timing I/O Device Calibration Procedure*

Technical Support Resources

NI Web Support

National Instruments 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`.

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Worldwide Support

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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 National Instruments corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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