

# CALIBRATING THE FP-AO-200 WITH CALIBRATION EXECUTIVE

## Contents

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Introduction .....	2
What Is Calibration? .....	2
Why Should You Calibrate? .....	2
How Often Should You Calibrate? .....	2
Equipment and Other Test Requirements .....	2
Test Equipment .....	2
Documentation .....	3
Software .....	3
Test Conditions .....	4
Calibration Procedures .....	4
Configuring the FP-AO-200 Module for Calibration .....	5
Connecting the DMM to the FP-AO-200 Module .....	10
Running the Calibration Executive Procedure .....	10
Troubleshooting and Common Questions .....	12
Technical Support Resources .....	13
NI Web Support .....	13
Worldwide Support .....	13

# Introduction

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This document contains step-by-step instructions for loading and running a calibration procedure for the FP-AO-200 using National Instruments Calibration Executive.

## What Is Calibration?

*Calibration* consists of verifying the measurement accuracy of a device and adjusting for any measurement error. *Verification* is measuring performance of a device and comparing the results to the factory specifications. Calibration Executive automates the verification and adjustment of National Instruments (NI) measurement devices.

## 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 the 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 the FP-AO-200 module. 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.

## Equipment and Other Test Requirements

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This section describes the equipment, documentation, software, and test conditions you need to calibrate the FieldPoint module using Calibration Executive.

### Test Equipment

The Calibration Executive procedure requires using a high-precision milliamp meter that is accurate to at least 300 ppm, and is NI-IVI supported. NI recommends that you use the following instruments for calibration:

- Digital Multimeter (DMM)—Hewlett-Packard 3458A or 34401A
- FieldPoint FP-1000 network module

- FP-TB-CAL FieldPoint Calibration Base (part number 777519-90), a modified FieldPoint base that allows you to write new calibration constants to the module EEPROM
- 11-24 V power supply PS-2
- RS-232 serial cable

If an HP 3458A is not available, use the milliamp meter accuracy specifications to choose a substitute milliamp meter as a calibration standard.

## Documentation

This section describes the documentation you need to calibrate the FieldPoint module. In addition to this calibration procedure, you may need to refer to the following documentation:

- *Calibration Executive Software User Manual*
- *FP-AO-200 Operating Instructions*
- *FP-1000/1001 User Manual*
- *FP-1000/1001 Quick Start Guide*

You can download these documents from the NI Web site at [ni.com/manuals](http://ni.com/manuals).

## Software

To calibrate the FP-AO-200 with Calibration Executive, you need to install the FieldPoint calibration procedure for Calibration Executive and FieldPoint Explorer on your system.

Complete the following steps to install the FieldPoint calibration procedure for Calibration Executive:

1. Make sure that your computer and monitor are powered on and that you have installed Windows NT/Me/98/95.
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, enter `x:\setup.exe` (where *x* is the letter of the CD-ROM drive you are using), then click **OK**.
6. Follow the onscreen instructions to complete the installation.

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\FP-AO-200\ 	Directory structure that contains the calibration procedures.
Calibration Executive\ Procedures\FP-AO-200\Support Files	Required support files.

Complete the following steps to install FieldPoint Explorer:

1. Insert the FieldPoint Explorer CD into the CD-ROM drive on your computer.
2. Choose the **Run** option from the **Start** menu on the desktop task bar.
3. In the command line box, enter `x:\setup.exe` (where *x* is the letter of the CD-ROM drive you are using), then click **OK**.
4. Follow the onscreen instructions to complete the installation.

## Test Conditions

Follow these guidelines to optimize connections and test conditions during calibration:

- Keep connections to the module short. Long cables and wires act as antennae, picking up extra noise that can affect measurements.
- Use shielded copper wire for all cable connections to the device. Use twisted-pair wire to eliminate noise and thermal offsets.
- Maintain a temperature between 18 and 28 °C. To operate the module at a specific temperature outside this range, calibrate the module at that temperature.
- Keep relative humidity below 80%.
- Allow a warm-up time of at least 15 minutes to ensure that the measurement circuitry is at a stable operating temperature.

## Calibration Procedures

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This section explains how to configure and set up the module for calibration, and how to run the Calibration Executive procedure. In automated mode, the calibration procedure should take approximately five minutes. In manual mode, the calibration procedure takes approximately 12 minutes.

Calibration consists of two main steps:

1. Configuring the module for calibration, which is described in the *Configuring the FP-AO-200 Module for Calibration* section of this document.
2. Running the procedure to calibrate the module, which is described in the *Running the Calibration Executive Procedure* section of this document.

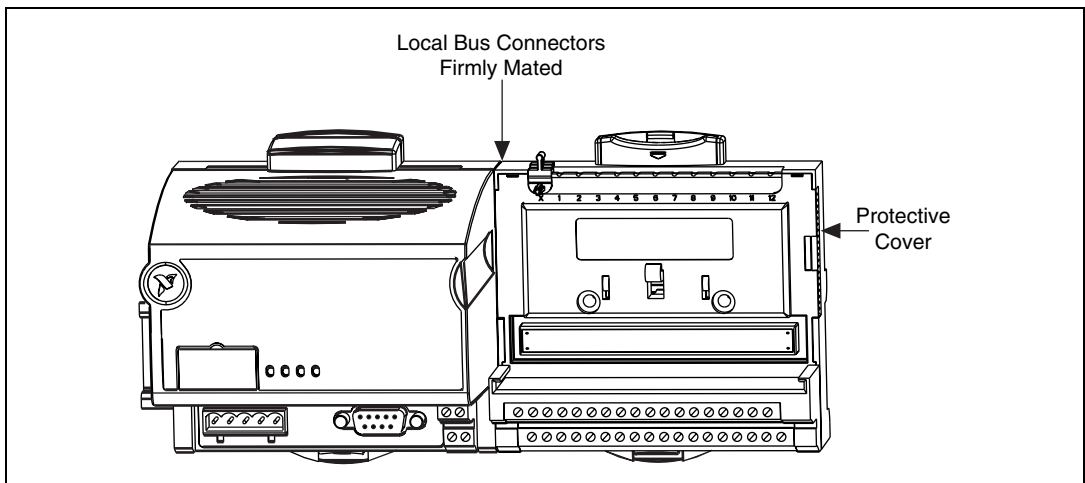


**Note** For an explanation of automated versus manual calibration, refer to the *Automated Versus Manual Calibration* section in Chapter 2, *Calibration Executive System Overview*, of the *Calibration Executive Software User Manual*.

## Configuring the FP-AO-200 Module for Calibration

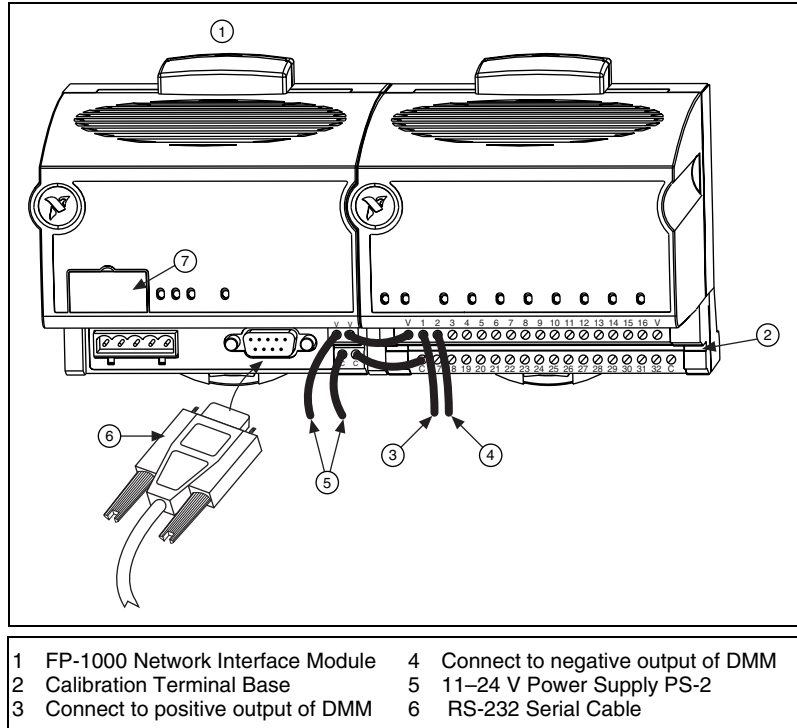
To verify the operation of the test fixture, build a FieldPoint bank with a network module, calibration terminal base, power supply, and the FP-AO-200 module you are calibrating. Build the FieldPoint bank as follows:

1. Attach the network module to the calibration base as shown in Figure 1.



**Figure 1.** Connecting FieldPoint Terminal Bases

- Place the FP-AO-200 module on top of the calibration terminal base as shown in Figure 2.





**Figure 2.** FP-AO-200 on Calibration Terminal Base

- Connect the bank to the host computer using an RS-232 cable.
- Select the appropriate baud rate that your computer supports on the network interface module. Table 2 shows the available baud rates.



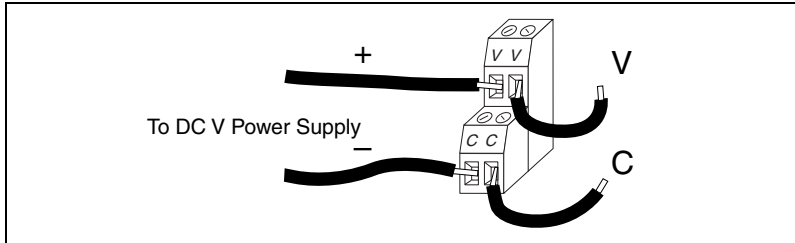
**Note** The default baud rate for the FP-1000 is 115,200, which provides the fastest performance. Do not change this rate unless you experience communications problems.

**Table 2.** Baud Rate Switch Settings for the FP-1000/1001

Switch Positions 6–8	Network Module Baud Rate
	300
	1,200
	2,400
	9,600
	19,200
	38,400
	57,600
	115,200

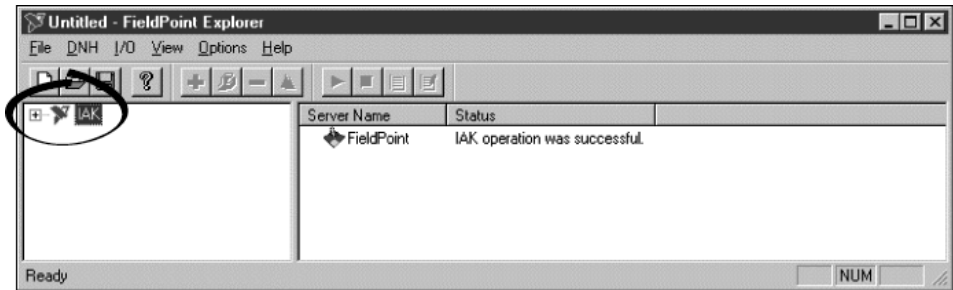
5. Connect the positive wire of the power supply into the first V terminal of the network module. Connect the negative wire of the power supply into the first C terminal of the network module.

6. Power the FP-AO-200 module by completing the following steps as shown in Figure 3:
  - a. Connect the second V terminal on the network module with either V terminal on the FP-AO-200 module.
  - b. Connect the second C terminal on the network module with either C terminal on the FP-AO-200 module.



**Figure 3.** FP-1000/1001 Power Connector Pinout

7. Launch FieldPoint Explorer.
8. Expand the + directory tree, which is on the left side of the FieldPoint Explorer window (see Figure 4).



**Figure 4.** FieldPoint Explorer

9. Right-click the FieldPoint icon and select **Add a comm resource to this server.**
10. In the **Comm Resource Configuration** dialog box, which is shown in Figure 5, select the port to which the FieldPoint system is connected. Make sure the baud rate matches what the network module is set to use, and click **Find Devices.**



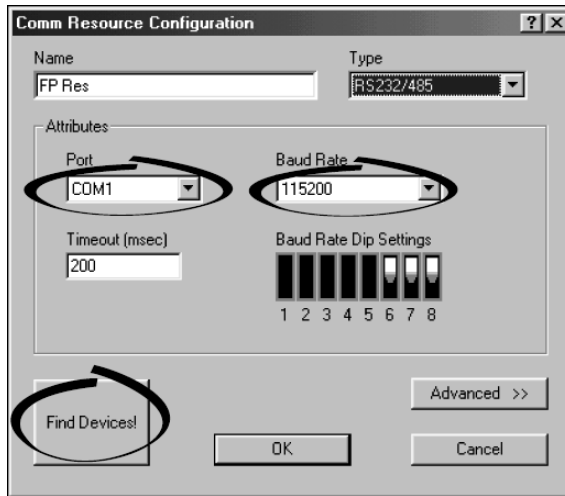


Figure 5. Comm Resource Configuration

11. Expand the view to show the devices found on the network, as shown in Figure 6. If you do not see the module that you want to calibrate, the network module is not communicating correctly with either the host or the FieldPoint module.

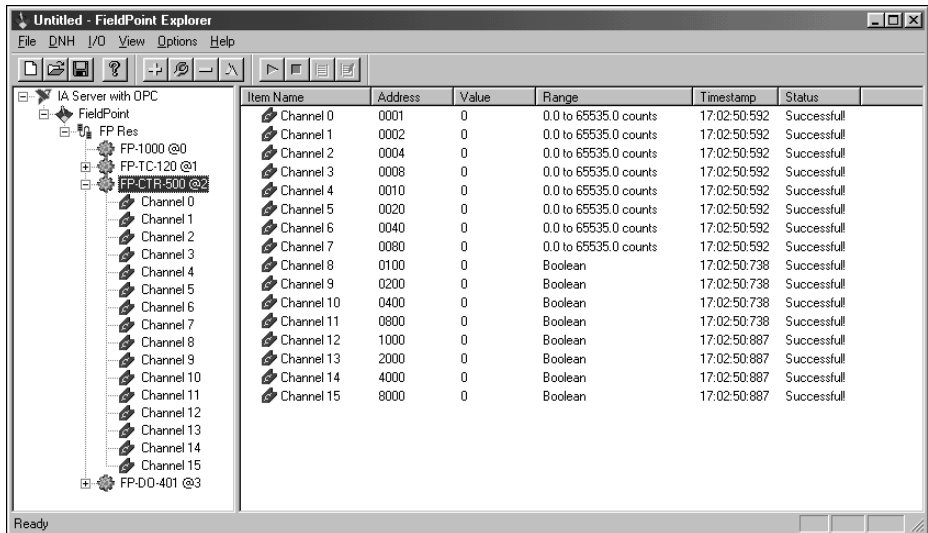


Figure 6. Expanding the View of the + Directory Tree

12. Close FieldPoint Explorer before you go on to the next section.



**Caution** You *must* close FieldPoint Explorer and keep it closed during the remainder of this procedure to prevent a system crash.

## Connecting the DMM to the FP-AO-200 Module

To connect the DMM to the FieldPoint module, complete the following steps:

1. Connect the positive current lead of the DMM to the  $I_{out}$  terminal of channel 0 (terminal 1). Refer to Table 3 for signal connections. When you run the Calibration Executive procedure, you are prompted to connect the positive current lead of the DMM to the  $I_{out}$  terminals of the remaining channels.

**Table 3.** FP-AO-200 Terminal Pin Assignments

Channel	Terminal $I_{out}$
CH0	1
CH1	3
CH2	5
CH3	7
CH4	9
CH5	11
CH6	13
CH7	15

2. Connect the negative current lead of the DMM to the COM terminal of channel 0 (terminal 2) on the FP-AO-200. You can leave this connected for the remainder of the procedure.
3. Configure the DMM to measure DC current.
4. Make sure all other terminals on the terminal base are open.

## Running the Calibration Executive Procedure

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

1. Launch Calibration Executive and follow the instructions in the Calibration Configuration Wizard to load the FP-AO-200 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. Enter the following information about the installed hardware when prompted by Calibration Executive:
  - **Digital Multimeter Information**—The DMM you are using for this calibration procedure (for example, the HP 34401A).
  - **Available Address**—Select **None** if you are using the manual mode; otherwise, select the GPIB address of the DMM.
3. When the procedure is loaded, click **Run Procedure** to begin.
4. Follow any instructions you receive from Calibration Executive, such as to connect the DMM to each module channel.
5. Enter the following information in the first dialog box:
  - **Password**—The default password, **NATI**.
  - **Baud Rate**—The correct rate from Table 2 to communicate with the network module.
  - **Port Number**—The serial port used to connect to the FP-1000 network module, for example, COM1, COM2, and so on.
  - **Device Number**—The address of the IO module you want to verify or calibrate. The first module to the right of a network module has an address of 1.

If you enter a parameter incorrectly, Calibration Executive prompts you to re-enter the information.

6. Follow the prompts from the Calibration Executive procedure to change the positive current lead of the DMM to the positive terminal of the respective channel. Refer to Table 3 for more information on channels and their terminals.

After the procedure finishes, complete the following steps to see the calibration report:

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

You have completed calibrating your FP-AO-200 module with Calibration Executive.



**Note** If the FP-AO-200 module fails after calibration, return it to NI for repair or replacement.

# Troubleshooting and Common Questions

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**When I change the baud rate of the FP-1000 and run the Calibration Executive procedure, a Communication Error dialog box prompts me to re-enter the correct baud rate. What steps do I need to take to do this?**

Power down the FP-1000, then power back up again to enable the new settings that you entered.

**Some test points fail even after I run the Calibration Executive procedure. What can I do to correct this problem?**

Before running the Calibration Executive procedure, allow the FieldPoint bank to warm up at least 15 minutes to ensure accurate readings. Also, make sure you are using shielded copper wire for all cable connections to the module.

**Communication with the FP-AO-200 module times out. What causes this to happen?**

The watchdog timer on the FP-1000 might be enabled. Refer to the *FP-1000/1001 User Manual* to find out how to disable the watchdog timer.

# Technical Support Resources

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## 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](http://ni.com).

## Worldwide Support

National Instruments 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](http://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 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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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,  
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