

USER GUIDE

Calibrating FieldPoint™ Analog Input Modules with Calibration Executive

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Introduction

This document contains step-by-step instructions for loading and running National Instruments Calibration Executive to calibrate FieldPoint analog input (AI) modules, including the FP-AI-100, FP-AI-110, FP-AI-111, FP-RTD-122, and FP-TC-120.

Equipment and Other Test Requirements

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

Test Equipment

Calibration requires using a high-precision calibrator with the voltage accuracy in parts per million (ppm) listed in Table 1.

NI recommends that you use the following instruments for calibration:

Table 1. Test Equipment Specifications and Recommended Models

FieldPoint Module	Voltage Accuracy (ppm)	Recommended Calibrator
FP-AI-100	500 ppm	Fluke 5500A or better
FP-AI-110	100 ppm	Fluke 5500A or better
FP-AI-111	100 ppm	Fluke 5500A or better
FP-RTD-122	20 ppm	Fluke 5700A
FP-TC-120	30 ppm	Fluke 5520A or better

- FieldPoint FP-1000 serial network module
- FP-TB-CAL FieldPoint Calibration Terminal Base (part number 777519-90), a modified FieldPoint base that enables you to write new calibration constants to the module EEPROM
- 11–24 V power supply—NI PS-2 power supply
- RS-232 serial cable

If a Fluke 5700A is not available, use the accuracy specifications to choose a substitute calibration standard.

Documentation

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

- *Calibration Executive Software User Manual*
- *FP-1000/1001 User Manual*
- *FP-1000/1001 Quick Start Guide*
- Operating instructions for the AI module

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

Software

The Calibration Executive setup program installs Calibration Executive, the FieldPoint software, and the associated files listed in Table 2. Refer to the *Calibration Executive Software User Manual* for more information about installing and uninstalling Calibration Executive software and procedures.

Table 2. Calibration Executive Directories and Supporting Files

Directory Name	Contents
Calibration Executive \Procedures\ FP-XX-XXX\Limits	Microsoft Access database that stores the calibration limits for FieldPoint AI modules (excluding FP-TC-120)
Calibration Executive\Procedures\ FP-XX-XXX	Directory structure that contains the calibration procedures
Calibration Executive\Procedures\ FP-XX-XXX\Support Files	Required support files

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. If you intend 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

This section explains how to configure and set up the module for calibration, and how to run the Calibration Executive procedure. Refer to Table 3 for the approximate times to complete the procedure in both automated and manual modes.

Table 3. Approximate Time to Complete Calibration Executive Procedure

Module	Automated Mode	Manual Mode
FP-TC-120	10 minutes	15 minutes
FP-AI-100	70 minutes	120 minutes
FP-AI-110	20 minutes	30 minutes
FP-AI-111	30 minutes	45 minutes
FP-RTD-122	10 minutes	15 minutes



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

Configuring the FieldPoint AI Module for Calibration

Complete the following steps to build the FieldPoint bank:

1. Attach the network module to the FP-TB-CAL as shown in Figure 1.

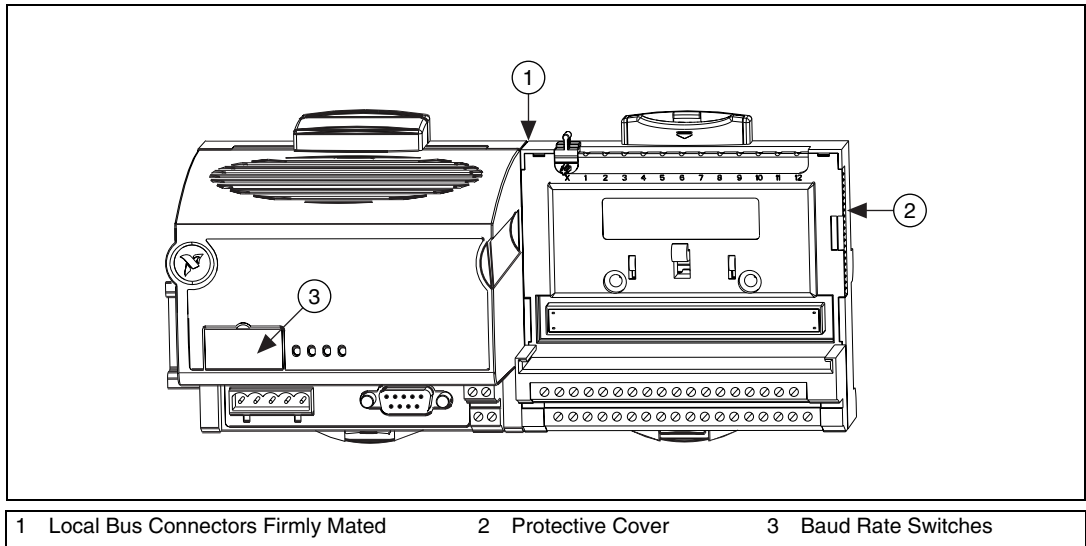

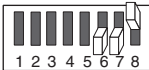








Figure 1. Connecting FieldPoint Terminal Bases

2. Install the FieldPoint AI module on the calibration terminal base as described in the module operating instructions.
3. Connect the bank to the host computer using an RS-232 cable.
4. Use the DIP switches on the network interface module to select a baud rate that your computer supports. Table 4 shows the available baud rates. The default baud rate for the FP-1000 is 115,200, which provides the fastest performance. You do not need to change this setting unless you experience communication problems.

Table 4. 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 to the first V terminal of the network module. Connect the negative wire of the power supply to the first C terminal of the FP-1000 network module as shown in Figure 2.

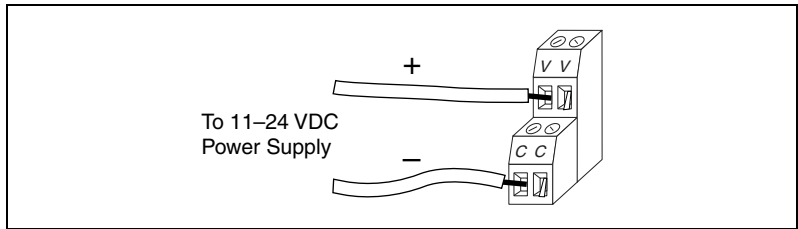
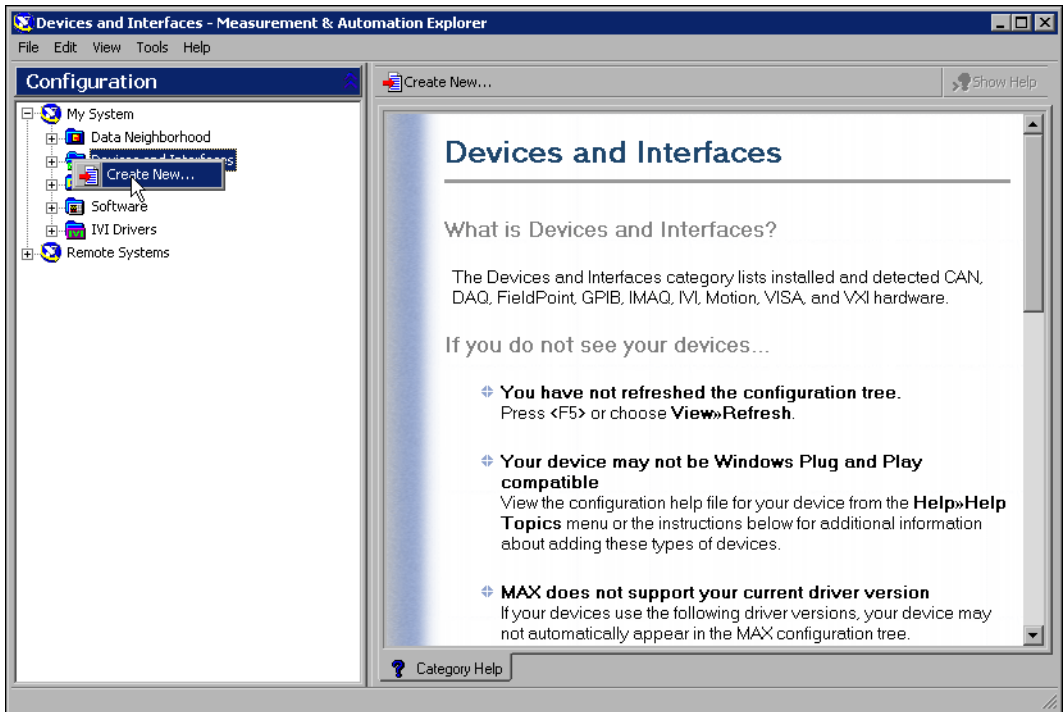
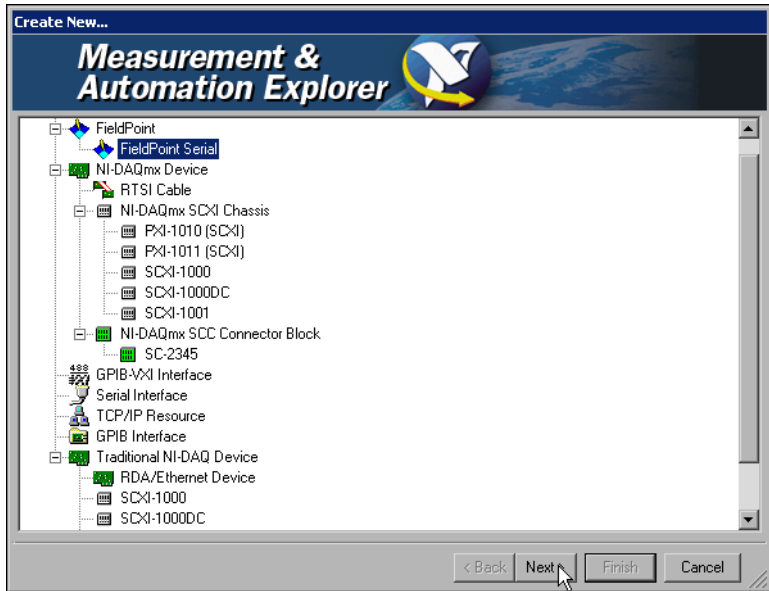


Figure 2. FP-1000/1001 Power Connector Pinout

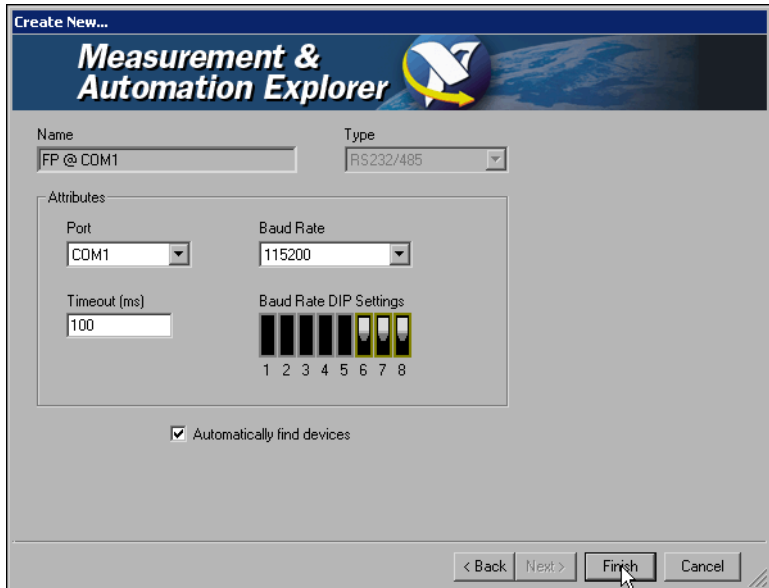
6. Launch Measurement & Automation Explorer (MAX).
7. In the MAX configuration tree, right-click **Devices and Interfaces** and select **Create New**.



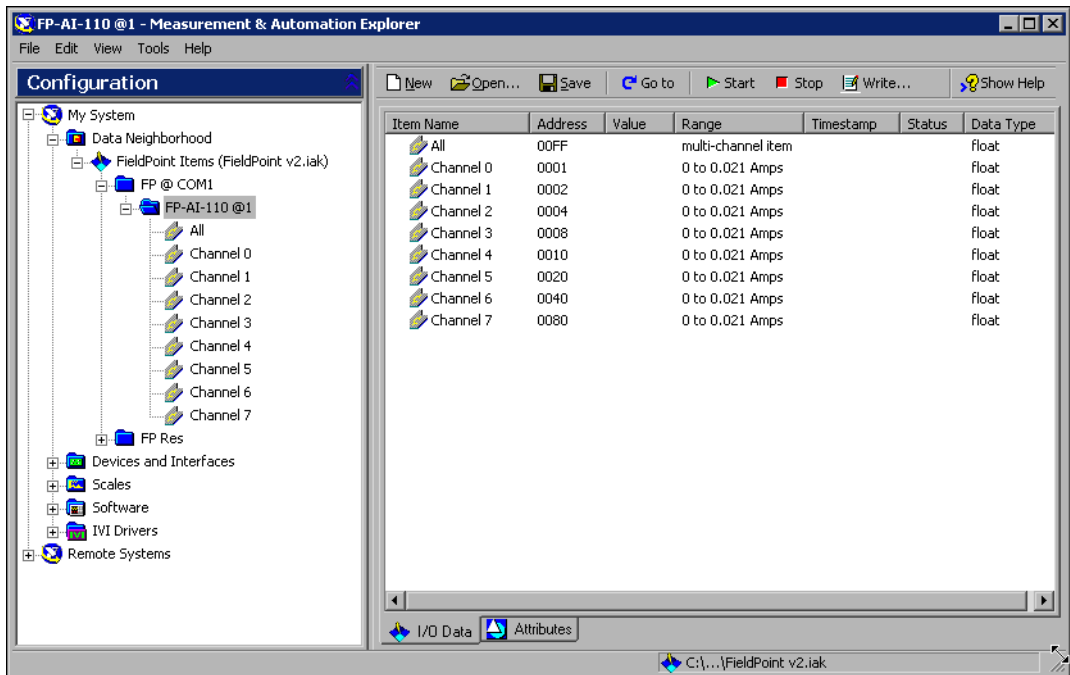
8. Select **FieldPoint Serial**, then click **Next**.



9. Change the serial configuration if you need to, then click **Finish**.



- Under **My System»Data Neighborhood**, expand the configuration tree until the I/O module you want to calibrate appears. If you do not see the module, the network module is not communicating properly with either the host or the I/O module. Check the connections and try again.



- Close MAX before you go on to the next section. You do not need to save the .iak file.

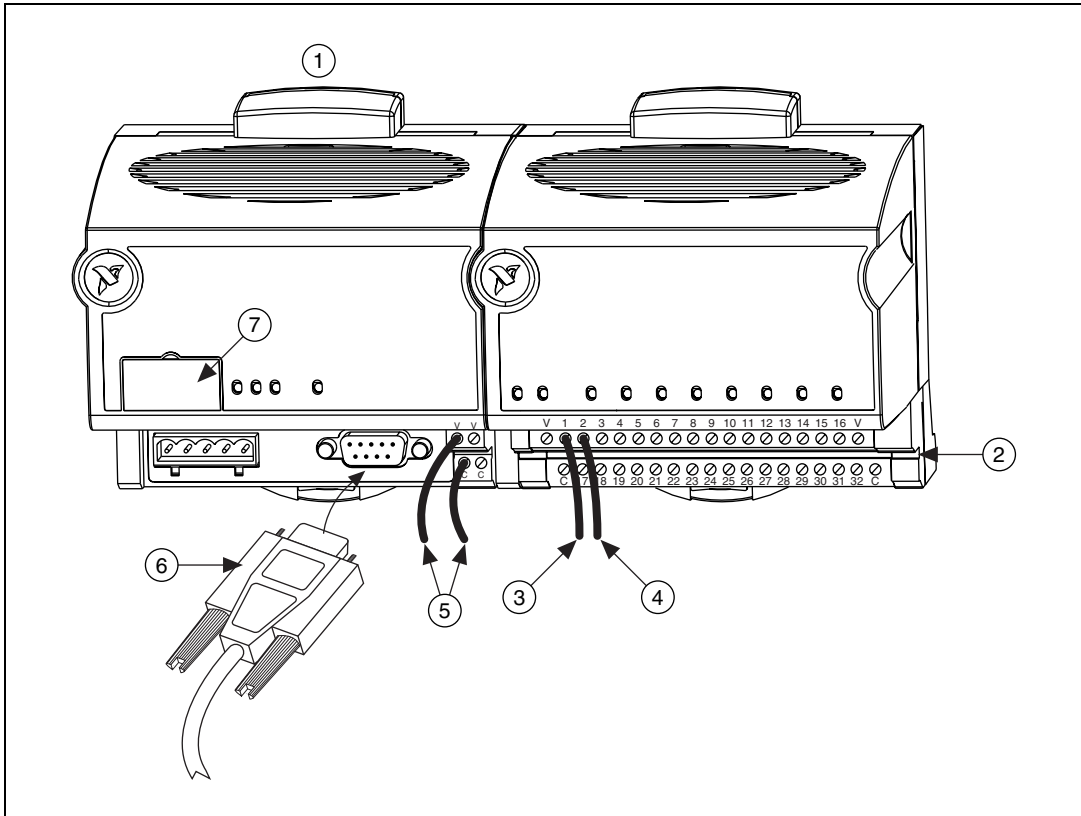


Caution You *must* close MAX and keep it closed during the remainder of this procedure to prevent a system crash.

Connecting the Calibrator to an FP-TC-120 Module

If you are calibrating the FP-TC-120, make the following connections as shown in Figure 3:

1. Connect the positive output (voltage) of the calibrator to terminal 1 of the calibration terminal base.
2. Connect the negative output (voltage) of the calibrator to terminal 2 of the calibration terminal base.



- | | |
|--|-----------------------------------|
| 1 FP-1000 Network Module | 5 To 11–24 VDC Power Supply |
| 2 TB-Cal Calibration Terminal Base | 6 RS-232 Serial Cable to COM Port |
| 3 To Positive Output (Voltage) of Calibrator | 7 Baud Rate Switches |
| 4 To Negative Output (Voltage) of Calibrator | |

Figure 3. FP-TC-120 Connections to Calibrator

Connecting the Calibrator to an FP-AI-1xx Module

If you are calibrating an FP-AI-100, FP-AI-110, or FP-AI-111 module, make the connections shown in Figure 4.

1. Connect the positive output (current) of the calibrator to terminal 2 of the calibration terminal base.
2. Connect the negative output (current) of the calibrator to terminal 18 of the calibration terminal base.

While the Calibration Executive procedure runs, you are prompted to make additional connections between the calibrator and the module you are calibrating. Follow the onscreen instructions at each prompt.

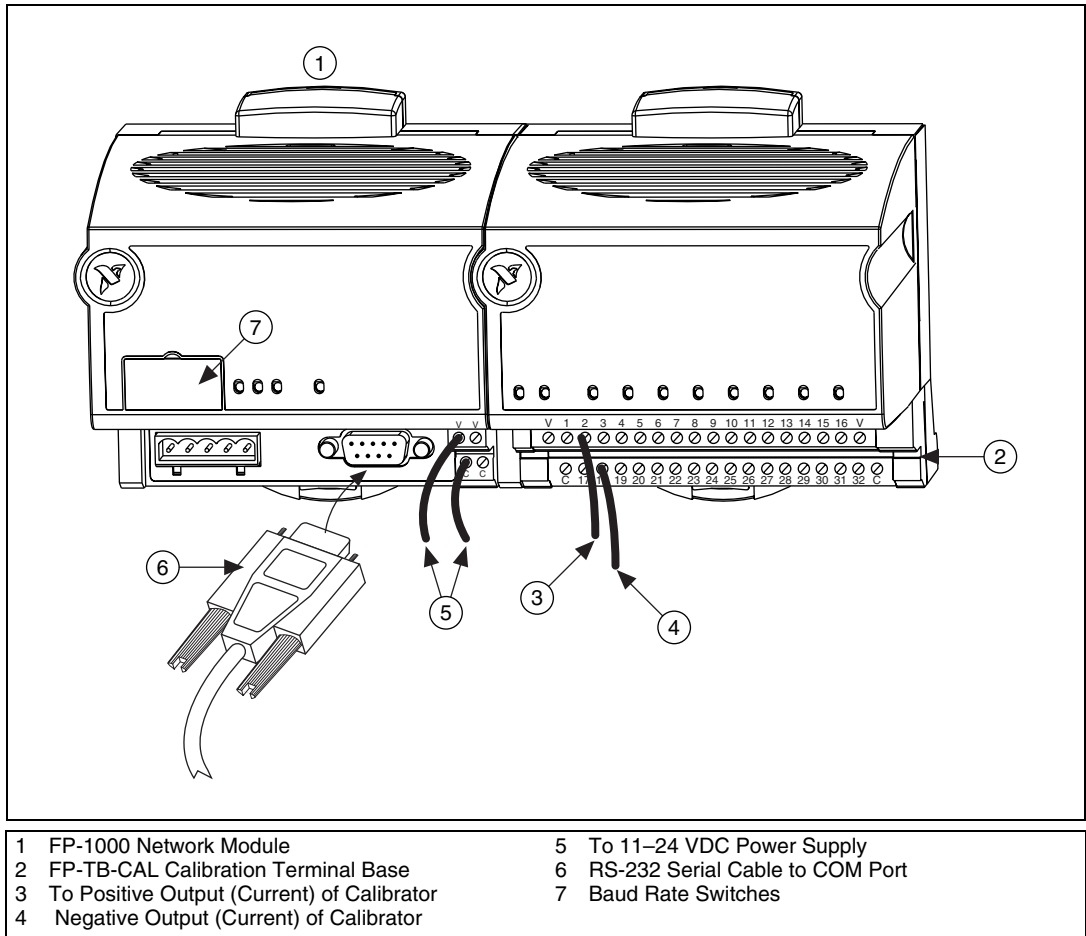


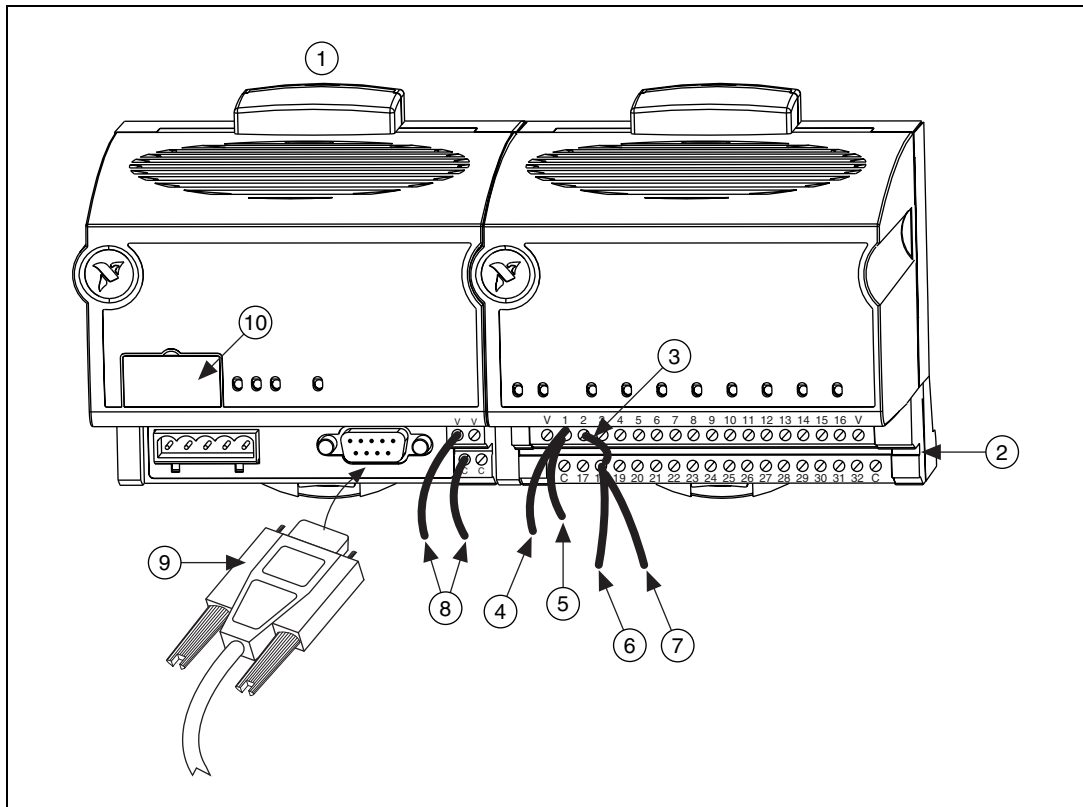
Figure 4. FP-AI-1xx Connections to Calibrator for Current Offset Testing

Connecting the Calibrator to an FP-RTD-122 Module

If you are calibrating the FP-RTD-122 module, make the following connections as shown in Figure 5.

1. Connect the positive output (ohms) and positive sense (ohms) of the calibrator to terminal 1 of the calibration base.
2. Connect the negative output (ohms) and the negative sense (ohms) of the calibrator to terminal 18 of the calibration base.
3. On the calibration terminal base, connect terminal 2 to terminal 18.

While the Calibration Executive procedure runs, you are prompted to make additional connections between the calibrator and the module you are calibrating. Follow the onscreen instructions at each prompt.



- 1 FP-1000 Network Module
- 2 TB-Cal Calibration Terminal Base
- 3 Terminal 2 to Terminal 18
- 4 To Positive Output of Calibrator
- 5 To Positive Sense of Calibrator

- 6 To Negative Output of Calibrator
- 7 To Negative Sense of Calibrator
- 8 To 11–24 VDC Power Supply
- 9 RS-232 Serial Cable
- 10 Baud Rate Switches

Figure 5. FP-RTD-122 Connections to Calibrator

Running the Calibration Executive Procedure

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

1. Launch Calibration Executive and follow the instructions in the Calibration Configuration Wizard to load the appropriate FieldPoint calibration procedure for the module. Refer to 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:
 - **Selected Calibrator Information**—The calibrator you are using for this calibration procedure (for example, the Fluke 5700A).
 - **Available Address**—Select *None* if you are using the manual mode; otherwise, select the GPIB address of the calibrator.
3. When the procedure is loaded, click **Run Procedure** to begin.
4. Enter the following information in the first dialog box, which is titled *FieldPoint Bank Configuration*:
 - **Baud Rate**—The correct rate from Table 4 to communicate with the network module.
 - **COM 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 I/O 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 value incorrectly, Calibration Executive prompts you to re-enter the information.

5. Follow any instructions you receive from Calibration Executive.

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 FieldPoint AI module with Calibration Executive.



Note If the FieldPoint AI module fails after calibration, return it to NI for repair or replacement.

Troubleshooting and Common Questions

When I change the baud rate of the FP-1000 and run the Calibration Executive procedure, a dialog box prompts me to re-enter the correct baud rate. How do I do that?

Power down the FP-1000, then power it 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.

In the FP-AI-100 current offset test, my test points are significantly out of specification. What causes this problem?

The voltage terminals (1, 3, 5, 7, 9, 11, 13, and 15) on the calibration base may still be connected together from the voltage offset test. Disconnect all the wires that connect these terminals before attempting the current offset test.

Communication with the FieldPoint AI module times out. What causes this to happen?

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

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.

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. Branch office Web sites provide up-to-date contact information, support phone numbers, email 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 (Vancouver) 514 685 7530, China 86 21 6555 7838,
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Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,
Germany 49 0 89 741 31 30, Greece 30 2 10 42 96 427,
India 91 80 51190000, Israel 972 0 3 6393737, Italy 39 02 413091,
Japan 81 3 5472 2970, Korea 82 02 3451 3400, Malaysia 603 9131 0918,
Mexico 001 800 010 0793, Netherlands 31 0 348 433 466,
New Zealand 0800 553 322, Norway 47 0 66 90 76 60,
Poland 48 22 3390150, Portugal 351 210 311 210,
Russia 7 095 783 68 51, Singapore 65 6226 5886,
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