

# SCXI-MS100 TEMPERATURE MEASUREMENT SYSTEM

This guide describes how to install and use the SCXI-MS100 temperature measurement system.

## Introduction

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The SCXI-MS100 is a complete virtual instrument-based temperature and voltage measurement system for Windows 95/NT. The system includes the software and hardware you need to acquire and log up to 32 channels of data without any programming. You can configure each channel for thermocouple or voltage input, and you can add additional SCXI modules to expand the number of channels to 128.

The SCXI-MS100 is ideal for multichannel temperature applications in many environments, such as process monitoring, industrial automation, and instrumentation. The SCXI-MS100 combines SCXI and multifunction data acquisition (DAQ) products to take accurate temperature measurements with thermocouples. Taking measurements with thermocouples requires amplification, cold-junction compensation (CJC), and high-resolution analog-to-digital converters (ADCs). In addition, the included VirtualBench-Logger software provides an interface that allows you to display and log data.

# What You Need to Get Started

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To set up and use your SCXI-MS100 temperature measurement system, you will need the following:

- SCXI-1000 chassis and documentation, with the following equipment preinstalled:
  - SCXI-1102/B/C 32-channel thermocouple amplifier
  - SCXI-1349 adapter board
  - Three SCXI-1360 front filler panels
  - Three SCXI-1361 rear filler panels
- AT-MIO-16XE-50 high-resolution multifunction I/O board and documentation
- SCXI-1303 32-channel isothermal terminal block and documentation
- SCXI-MS100 Temperature Measurement System Installation Guide*
- SCXI-1349 2 m cable and documentation
- SCXI Getting Started Kit
- Power cable
- The following National Instruments software and documentation:
  - VirtualBench-Logger
  - NI-DAQ for PC Compatibles 5.1 or later
- Two cable tie wraps
- Flathead screwdriver
- No. 1 Phillips-head screwdriver

# Installation

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Perform the following steps to set up your SCXI-MS100 system.



**Note**

*You should install your software before you install your hardware.*

## Installing Your Software

### NI-DAQ

1. Insert the NI-DAQ CD into your CD-ROM drive.
2. Select **Install NI-DAQ**.
3. Follow the installer prompts through the rest of the installation.

### VirtualBench

1. Insert the VirtualBench CD into your CD-ROM drive.
2. Click on **Install VirtualBench** from the installation window that appears on your computer screen.
3. When prompted to select your VirtualBench setup options, select **Custom**.
4. When the next screen appears, select **VirtualBench Engine and Support Files** and **VirtualBench-Logger Files**.
5. When the next screen appears, click **Finish**.
6. Follow the installer prompts through the rest of the installation.

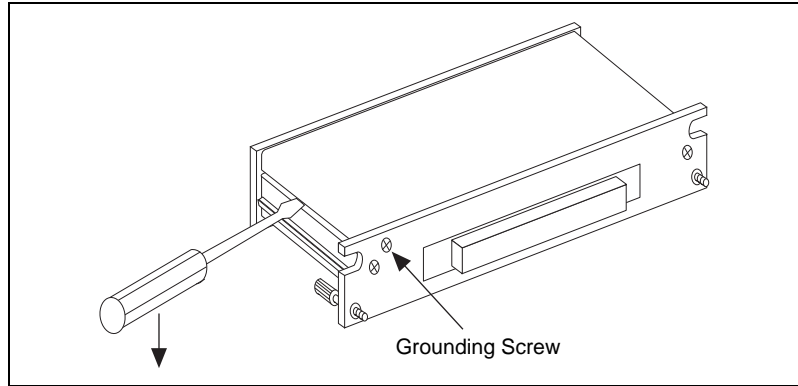
## Installing Your AT-MIO-16XE-50 Board

1. Turn off the power to your computer.
2. Record the serial number of your AT-MIO-16XE-50 board on the appropriate form in the *Customer Communication* appendix of your *AT E Series User Manual*.
3. Install your board into one of the AT expansion slots in your computer. There are no jumpers or DIP switches to set.
4. Turn on the power and start your computer.

## Signal Connection

To connect the signal wires to the SCXI-1303 terminal block, refer to Figures 1 and 2 as necessary while you perform the following steps:

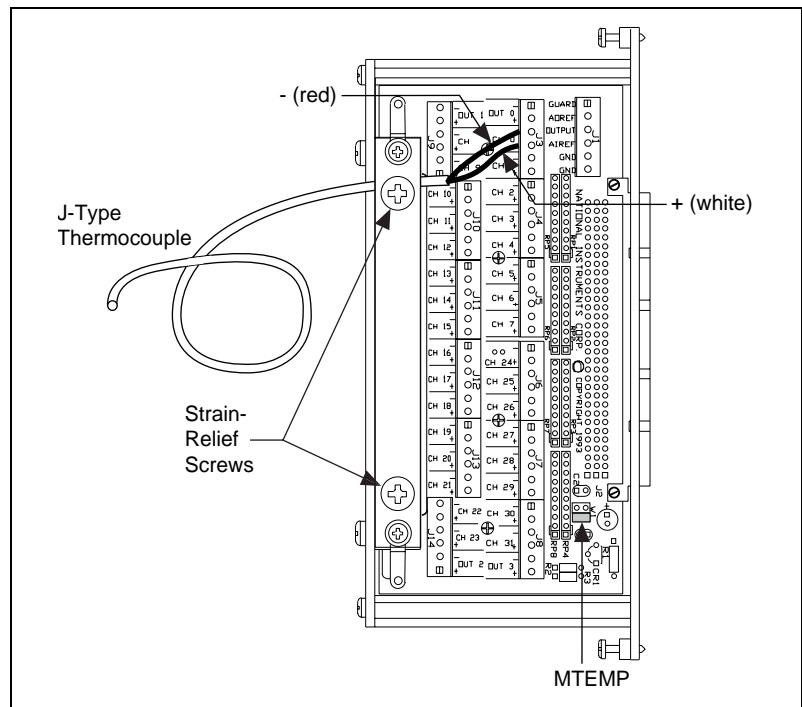
1. Remove the grounding screw of the SCXI-1303 top cover with a No. 1 Phillips-head screwdriver.
2. Snap out the top cover by placing a flathead screwdriver in the groove at the bottom of the terminal block and pushing down on the screwdriver, as shown in Figure 1.



**Figure 1.** Removing the SCXI-1303 Cover

3. Loosen the strain-relief screws with a No. 1 Phillips-head screwdriver and slide the thermocouple (included in your kit) through the front panel strain-relief opening. When you add your own thermocouples or wires, if they are not distributed evenly and there are gaps in the strain-relief opening, add insulation or padding as needed for even closure.
4. Connect the wires to the SCXI-1303 screw terminals by inserting the wires into the terminals and tightening the screws with a flathead screwdriver. Refer to Figure 2 to install the thermocouple on channel 0.
5. Tighten the strain-relief screw.
6. Snap the top cover back into place.
7. Reinsert the grounding screw to ensure proper shielding.

Figure 2 shows the SCXI-1303 terminal block parts locator diagram.



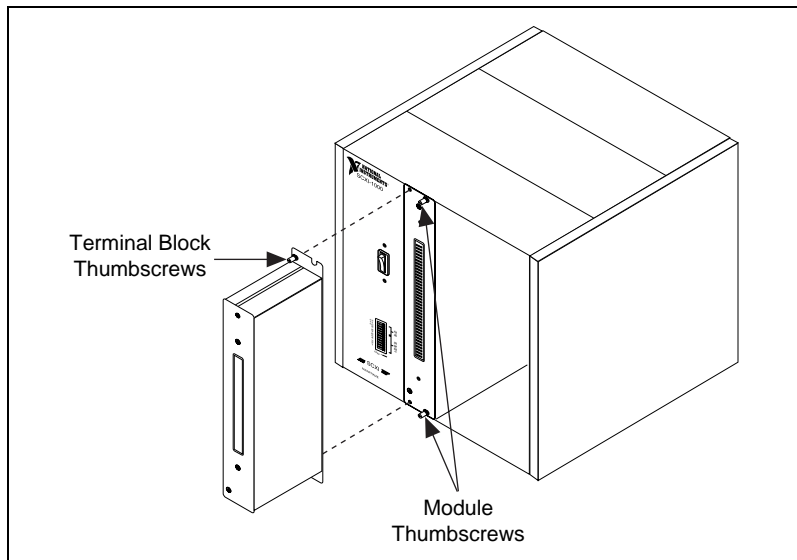
**Figure 2.** Thermocouple Connected to Channel 0 of the SCXI-1303 Terminal Block

You are ready to connect the SCXI-1303 terminal block to the SCXI-1102 module front connector.

## Connecting the SCXI-1303 to Your SCXI-1102 Module

To connect the SCXI-1303 terminal block to your SCXI-1102 module front connector, refer to Figure 3 and perform the following steps:

1. Turn off your SCXI-1000 chassis.
2. Connect the SCXI-1303 terminal block to the SCXI-1102 module front connector.
3. Make sure that the SCXI-1102 module top and bottom thumbscrews do not obstruct the rear panel of the SCXI-1303 terminal block.
4. Tighten the top and bottom thumbscrews on the back of the terminal block to hold it securely in place and to ensure proper shielding.
5. Turn on the SCXI-1000 chassis.



**Figure 3.** Connecting the SCXI-1303 Terminal Block to the SCXI-1102 Module



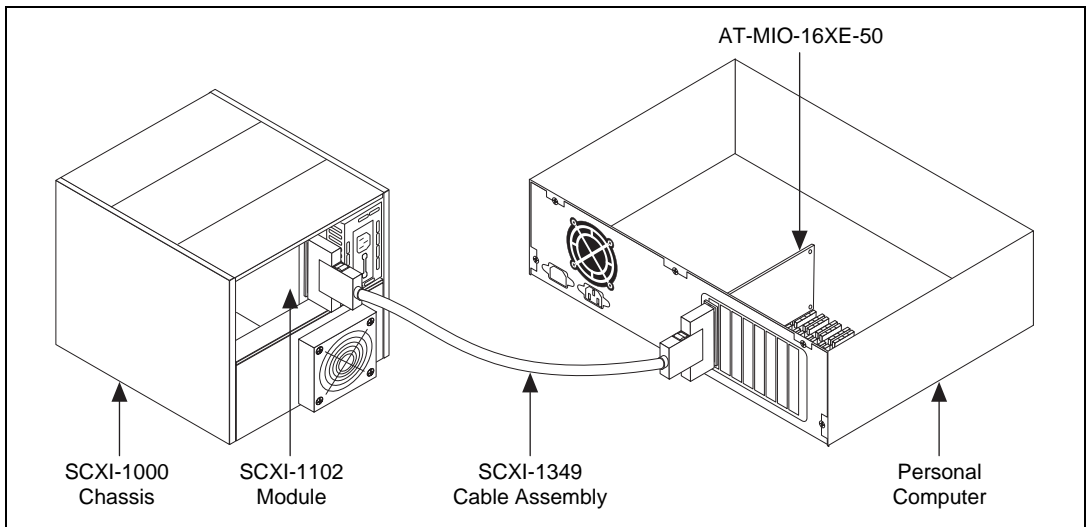
**Note**

*Place the SCXI chassis away from any extreme temperature differential to minimize the temperature gradient inside the terminal block and maintain its isothermal nature for accurate cold-junction compensation.*

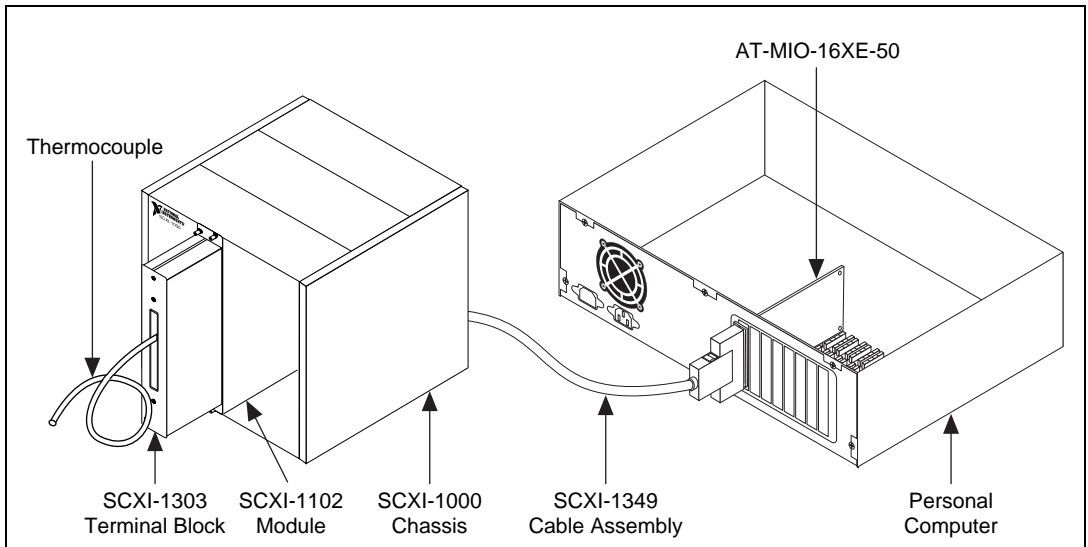
## Installing the SCXI-1349 Shielded Cable

Refer to Figures 4 and 5 as you perform the following steps to install the SCXI-1349 cable:

1. Turn off the power to your computer and the SCXI-1000 chassis.
2. Connect one end of the SCXI-1349 cable to the 68-pin connector of the SCXI-1349 adapter board (preinstalled on the rear of the SCXI-1102 module).
3. Connect the other end of the cable to the I/O connector of the AT-MIO-16XE-50 board.
4. Secure the cable to a fixed object with the tie wraps to relieve the strain on the cable. Strain relief is important because the SCXI-1349 shielded cable has a long stiff backshell that can exert leverage on the MIO board connector.



**Figure 4.** Connecting the SCXI-1349 Cable to Your SCXI-1102 Module and DAQ Board



**Figure 5.** The Complete Installation

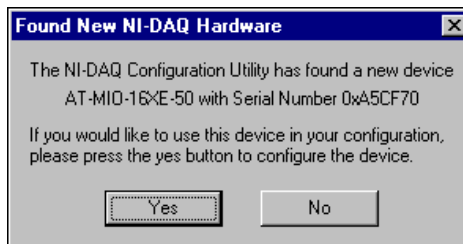
# Software Configuration

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## Configuring Your AT-MIO-16XE-50

The first time you turn on your computer after installing the AT-MIO-16XE-50, NI-DAQ recognizes and assigns resources to the board through the device manager in Windows 95. If you are using Windows NT, refer to Chapter 2, *Installation and Configuration*, of the *AT E Series User Manual*.

From Windows, run the NI-DAQ Configuration Utility, located under **Start»Programs»NI-DAQ for Windows**. It will prompt you to configure your device, as shown in Figure 6.



**Figure 6.** Configuring the AT-MIO-16XE-50

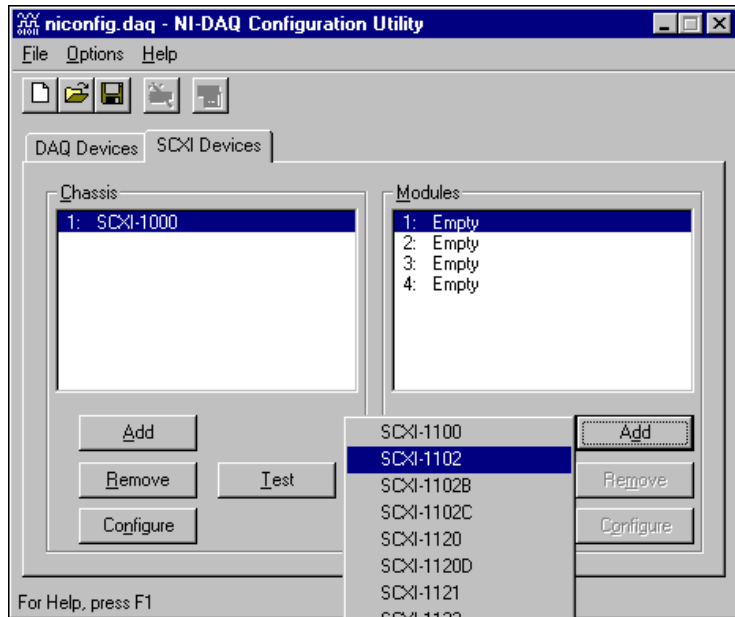
To configure your AT-MIO-16XE-50, complete the following steps:

1. Click on **Yes**.
2. You will be led through four screens to configure the system setting, system settings, analog input settings, analog output settings, and accessory settings. Click on **Next** on the first three and **Finish** on the last to retain the default settings for the device.



# Configuring Your SCXI Equipment

Figure 7 shows the **SCXI Setup Window** you use to configure your SCXI equipment.

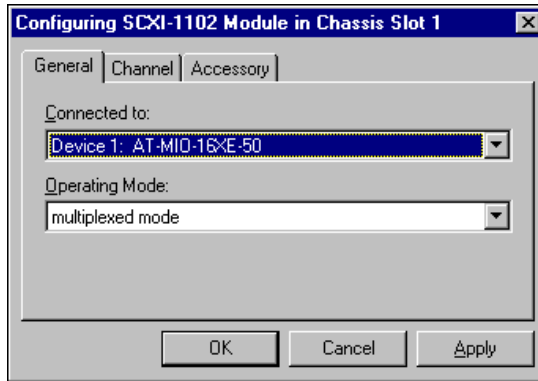


**Figure 7.** SCXI Setup Window

To configure your SCXI equipment, complete the following steps:

1. Click on the **SCXI Devices** tab.
2. Click on the **Add** button in the **Chassis** box.
3. Select **SCXI-1000 Chassis**.
4. When prompted, set the **Chassis ID** to 1 and the **Chassis Address** to 0.
5. Click on **1: Empty** in the **Modules** box.
6. Click on the **Add** button in the **Modules** box.
7. Select **SCXI-1102**.
8. In the **Modules** box, click on **Configure**. A popup window appears.

Figure 8 shows the general tab you use to configure your SCXI module.

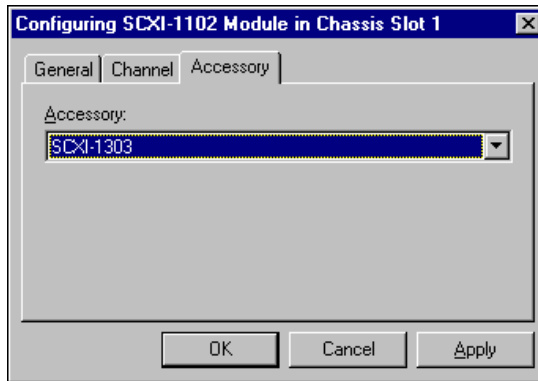


**Figure 8.** SCXI Module General Tab

To connect to the proper device and select the proper mode, complete the following steps:

1. Under the **General** tab, set the **Connected To:** option to **Device 1: AT-MIO-16XE-50**.
2. Set the **Operating Mode** option to **multiplexed mode**.

Figure 9 shows the accessory tab you use to configure your SCXI module.



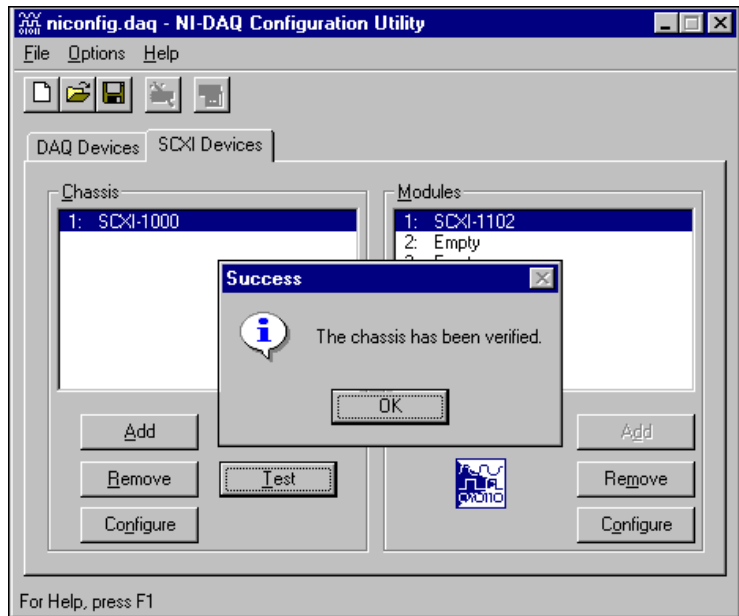
**Figure 9.** SCXI Module Accessory Tab

To select the proper accessory for your SCXI module, complete the following steps:

1. Under the **Accessory** tab, set the **Accessory** option to **SCXI-1303**.
2. Click on **OK**.

This closes the popup window and returns to the **SCXI Setup** window.

Figure 10 shows how to verify your SCXI chassis.



**Figure 10.** Verifying the SCXI Chassis

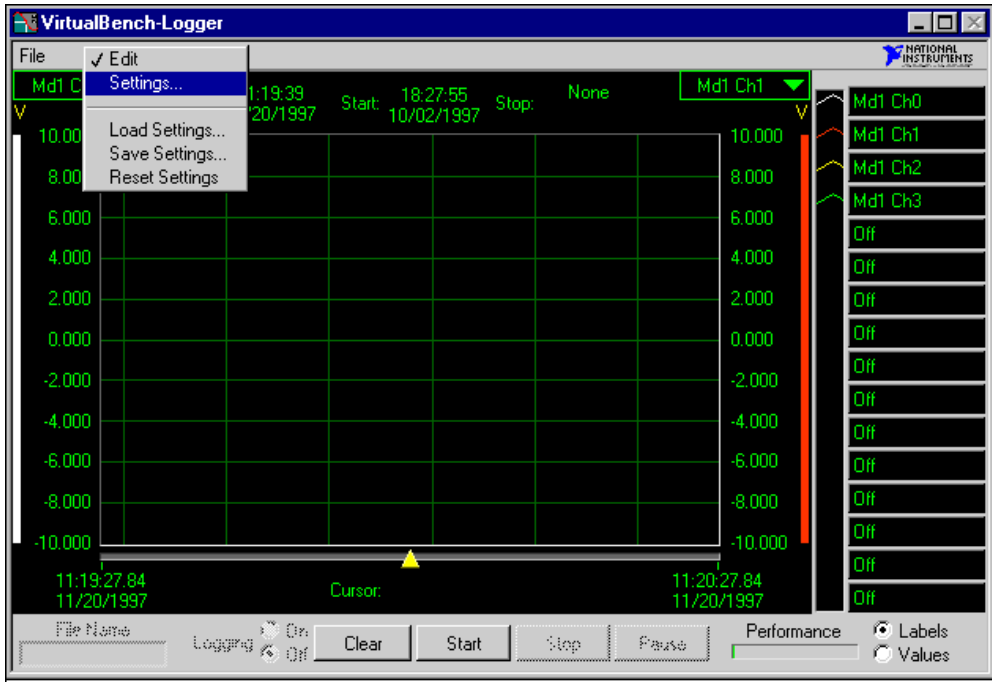
To verify your SCXI chassis, complete the following steps:

1. Click on the **SCXI Devices** tab.
2. In the **Chassis** box, click on the **Test** button.
3. A popup window appears with the message The Chassis has been verified. Click on **OK**.
4. Under the **File** menu, select **Save**.
5. Under the **File** menu, select **Exit**.

After you complete the SCXI hardware configuration and verify your SCXI chassis, you are ready to run the VirtualBench-Logger software.

# Configuring the VirtualBench-Logger

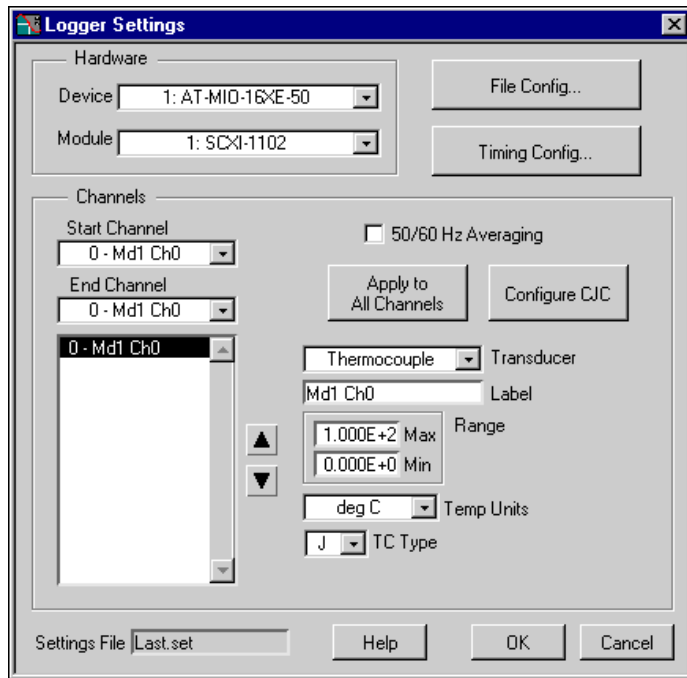
From Windows, run the VirtualBench-Logger software, located under **Start»Programs»VirtualBench 2.1»VirtualBench-Logger**. Figure 11 shows the main run-time window for the VirtualBench-Logger.



**Figure 11.** VirtualBench-Logger Main Run-Time Window

To configure the settings in the VirtualBench-Logger, select **Edit»Settings**.

Figure 12 shows the **Logger Settings** window.

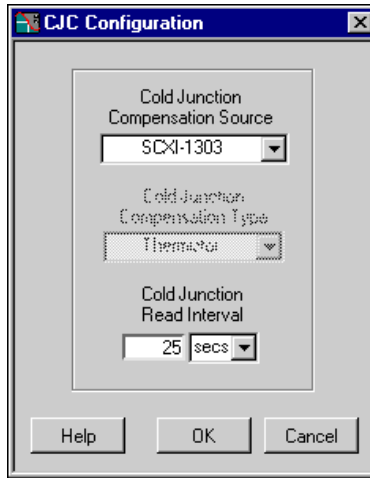


**Figure 12.** VirtualBench-Logger Settings Window

To properly set your VirtualBench-Logger, complete the following steps:

1. In the **Hardware** box, set the **Device** to **1: AT-MIO-16XE-50**.
2. Set the **Module** to **1: SCXI-1102**.
3. In the **Channels** box, set the **End Channel** to **0-Md1 CH0**.
4. Set the **Transducer** type to **Thermocouple**.
5. Set the **Temp Units** type to **deg C**.
6. Set the **TC Type** to **J**.
7. Set the **Min** input range to **0.000E+0**.
8. Set the **Max** input range to **1.000E+2**.
9. Click on the **Configure CJC** button.

Figure 13 shows the **CJC Configuration** window.



**Figure 13.** CJC Configuration Window

To configure your CJC source, complete the following steps:

1. Set the **Cold Junction Compensation Source** to **SCXI-1303**.
2. Click on **OK**.

## Collecting Temperature Data

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You are now ready to collect temperature data. Press the **Start** button on the main run-time window; the **VirtualBench-Logger** window will display temperature data from the thermocouple.

For more information on configuring the VirtualBench-Logger and implementing its data-logging capabilities, refer to the VirtualBench online help located under the **Help** menu.

# Expanding for More Channels

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## Up to 32 Channels

The factory-default SCXI-MS100 system can accommodate up to 32 channels. To measure and log up to 32 thermocouple or voltage inputs, perform the following steps:

1. Remove the SCXI-1303 terminal block. Refer to the [Signal Connection](#) and [Connecting the SCXI-1303 to Your SCXI-1102 Module](#) sections of this document to connect the additional signals and reinstall the SCXI-1303. Make sure you connect the signals to consecutive input channels.
2. Run the VirtualBench-Logger software and go to **Edit»Settings**. Modify the **Start Channel** and **End Channel** to reflect the number of thermocouple or input signals that you have connected.

## More Than 32 Channels

You can expand the SCXI-MS100 system beyond 32 channels by adding up to three SCXI-MS100 32-channel expansion kits. Each kit includes one SCXI-1102 module and one SCXI-1303 terminal block.

To integrate an SCXI-MS100 32-channel expansion kit into your system, perform the following steps:

1. Turn off the SCXI-1000 chassis.
2. Remove one of the front metal filler panels.
3. Install the SCXI-1102 module into the available slot.
4. Connect the additional signals and install the SCXI-1303 by referring to the [Signal Connection](#) and [Connecting the SCXI-1303 to Your SCXI-1102 Module](#) sections in this document. Make sure you connect the signals to consecutive input channels.
5. Turn on the SCXI-1000 chassis.
6. Run the NI-DAQ Configuration Utility.
7. Refer to the [Configuring Your SCXI Equipment](#) section of this document to configure your expansion module.
8. Run the VirtualBench-Logger.
9. Go to **Edit»Settings** to set up the channels on the new SCXI-1102.



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