

GETTING STARTED GUIDE

NI DC Power Supplies and SMUs

This document contains English and Japanese language instructions.

このドキュメントは、英語および日本語で記載されています。ナショナルインスツルメンツの日本語マニュアルは、ni.com/manuals でご覧いただけます。

This document explains how to install, configure, and test an NI power supply or an NI source-measure unit (SMU). For detailed information about the features and programming options specific to the NI power supply or SMU, refer to the *NI DC Power Supplies and SMUs Help* at **Start»All Programs»National Instruments»NI-DCPower»Documentation**.



Note If you are running Windows 8, you may not have a Start menu. To access National Instruments programs and documentation, open the Start screen, type the name of the file or folder you want to access, and select the appropriate icon from the search results.

For example, to access the *NI DC Power Supplies and SMUs Help*, open the Start screen, type *NI DC Power Supplies and SMUs Help*, and select the appropriate icon from the results. To access device specifications, open the Start screen, type your device number (for example, 4154), and select the specifications document for your device. Use this method any time the Start menu is referenced in this document.

Refer to the specifications document included with the NI power supply or SMU for additional safety and EMC information. The most current specifications and other related documentation is available at ni.com/manuals. Visit ni.com/updates for the latest version of NI-DCPower instrument driver software.

Contents

Safety and Compliance	2
1. Verifying the System Requirements	2
2. Unpacking	2
3. Verifying the Kit Contents	3
Other Required Items	3
Optional Item (NI PXI-4110/4130 Only)	3
4. Installing the Software	4
5. Installing the Hardware	5
Uninstalling the NI Power Supply or SMU	7
6. Configuring and Testing in MAX	7

7. Connecting Signals	8
Connecting Optional Auxiliary 12 V Power (NI PXI-4110/4130 Only)	9
Sense Jumpers (NI PXIe-4112/4113 Only)	10
8. Programming the NI Power Supply or SMU	11
Acquiring Data Interactively	11
Acquiring Data Programmatically	11
NI-DCPower Examples	11
Appendix A: Troubleshooting	12
Appendix B: Where to Go for Support	12

Safety and Compliance

Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document for important safety and compliance information. For additional safety information, refer to the specifications document included with the NI power supply or SMU product.

1. Verifying the System Requirements

Your system must meet certain requirements to use NI power supplies and SMUs with NI-DCPower. For more information about minimum system, recommended system, and supported application development environments (ADEs), refer to the *NI-DCPower Readme*, which is available on the NI-DCPower media. After you install NI-DCPower, you can access the *NI-DCPower Readme* at **Start»All Programs»National Instruments»NI-DCPower»Documentation**.

2. Unpacking

The NI power supply or SMU ships in an antistatic package to prevent electrostatic discharge (ESD). ESD can damage several components on the device.



Caution *Never* touch the exposed pins of connectors or electronic circuitry.

To avoid ESD damage in handling the device, take the following precautions:

- Ground yourself with a grounding strap or by touching a grounded object.
- Touch the antistatic package to a metal part of your computer chassis before removing the device from the package.

Remove the device from the package, remove the packing foam and rubber screw covers, and inspect it for loose components or any other signs of damage. Notify NI if the device appears damaged in any way. Do *not* install a damaged device in your computer or chassis.

Store the device in the antistatic package when not in use.

3. Verifying the Kit Contents

To set up and use the NI power supply or SMU, you need the following items, which are contained in the shipping kit:

- NI power supply or SMU device and all accompanying connectivity accessories
- (NI PXIe-4112/4113 Only)** Auxiliary 48 V power source



Note The device requires the auxiliary 48 V power source that is included in the kit. For more information about the auxiliary 48 V power source, refer to the *NI PXIe-4112 Specifications* or *NI PXIe-4113 Specifications*.

- (NI PXIe-4112/4113 Only)** Four sense jumpers installed on the device
- NI-DCPower software media, which includes the *NI DC Power Supplies and SMUs Help* and the *NI-DCPower Readme*
- Other printed documents:
 - *NI DC Power Supplies and SMUs Getting Started Guide*
 - Specifications document included with the device
 - *Read Me First: Safety and Electromagnetic Compatibility*
 - *Maintain Forced-Air Cooling Note to Users*

Other Required Items

In addition to the kit contents, you also need the following items:

- 1/8 in. flathead screwdriver
- A PXI chassis, PXI Express chassis, PXI/CompactPCI, or PXI/SCXI combination chassis, chassis documentation, and a controller

Optional Item (NI PXI-4110/4130 Only)

If you choose to connect an optional auxiliary 12 V power source to an NI power supply or SMU that supports this feature, you must either purchase an NI APS-4100 auxiliary power source from NI (part number 779671-01) or use an auxiliary power source from a third-party vendor. For more information about connecting auxiliary power, refer to the [Connecting Optional Auxiliary 12 V Power \(NI PXI-4110/4130 Only\)](#) section of this document.

4. Installing the Software

NI-DCPower features a set of functions and attributes you can use to programmatically configure and control the NI power supply or SMU. Install or upgrade NI-DCPower *before* installing new hardware so that Windows can detect your device. To install NI-DCPower, complete the following steps:

1. (Optional) Install an ADE, such as LabVIEW or LabWindows™/CVI™, if you are developing an application for the NI power supply or SMU.



Note Always install or upgrade your NI application software *before* installing NI-DCPower. If you install application software after installing NI-DCPower, you must run the NI-DCPower installer again to install the correct application software support.

2. Insert the NI-DCPower media. The NI-DCPower installer should open automatically. If not, select **Start»Run**, and enter `x:\setup.exe`, where *x* is the letter of the media drive.
3. Follow the instructions in the installation prompts. If you see access and security messages during installation, accept the prompts to complete the installation. For troubleshooting and operating system-specific instructions, refer to NI Technical Support at ni.com/support.
4. When the installer completes, a dialog box appears that asks if you want to restart, shut down, or restart later. Select **Restart**.



Note (LabVIEW Real-Time Module) If you are using a system running the LabVIEW Real-Time Module, download NI-DCPower to the target using MAX. Refer to the *Measurement & Automation Explorer Remote Systems Help* by selecting **Help»Help Topics»Remote Systems** in MAX.

5. Installing the Hardware



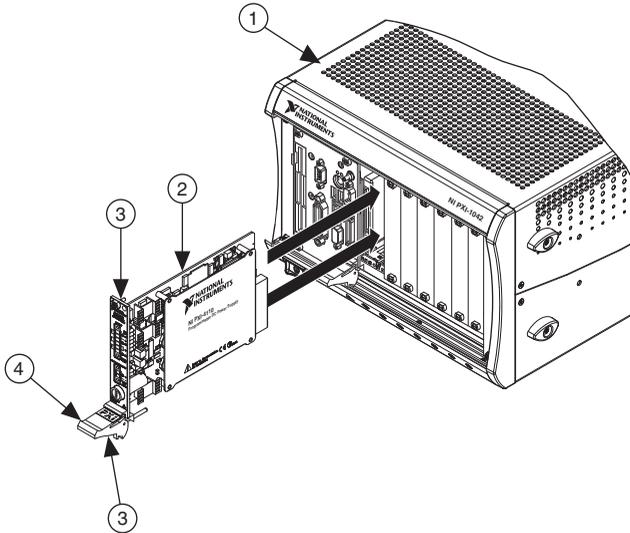
Caution To prevent damage caused by ESD or contamination, handle the NI power supply or SMU using the ejector handle, front panel, or PCB edges. Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document for more information.



Note Make sure you install the software *before* you install the hardware.

Refer to Figure 1 and complete the following steps to install any NI power supply or SMU.

Figure 1. NI PXI/PXI Express Installation



- | | | | |
|---|--|---|----------------|
| 1 | PXI/PXI Express Chassis | 3 | Captive Screws |
| 2 | NI PXI/PXI Express Power Supply or SMU | 4 | Ejector Handle |



Caution Make sure the PXI/PXI Express chassis is powered off *before* installing the device. NI power supplies and SMUs are *not* hot-swappable. Adding or removing the device while the chassis is powered on can result in blown chassis fuses or damage to the chassis and device.

1. Power off and unplug the PXI/PXI Express chassis.
2. Position the PXI/PXI Express chassis so that inlet and outlet vents are not obstructed. Refer to the chassis documentation for more information.

- Identify a supported slot in the PXI/PXI Express chassis. Refer to Table 1 to determine what slots support your NI power supply or SMU module if you are using a PXI Express chassis. Refer to the chassis documentation for details.

Table 1. Slot Identification Symbols in a PXI Express Chassis

Slot Symbol	Slot Use
	PXI Express System Controller Slot
	PXI Peripheral Slot
	PXI Express Peripheral Slot
	PXI Express Hybrid Peripheral Slot*
	PXI Express System Timing Slot

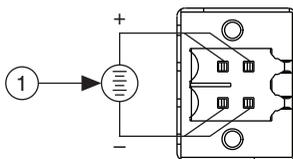
* NI PXI power supply and SMU products are PXI Express-compatible and can operate in standard PXI slots in a PXI/PXI Express chassis, as well as in PXI Express hybrid slots in a PXI Express chassis.

- Remove the filler panel from an unused PXI/PXI Express slot.
- Touch any metal part of the chassis to discharge static electricity.
- Ensure that the ejector handle of the device is in the unlatched (down) position and swings freely. Also ensure that you have removed all rubber screw covers.
- Holding the device by the injector/ejector handle, slide it into the empty slot, ensuring that the card engages with the card guides in the chassis, as shown in Figure 1.
- When you begin to feel resistance, pull up on the injector/ejector handle to latch the device.
- Tighten the screws at the top and bottom of the device front panel.
- Cover all empty PXI/PXI Express slots using blank PXI/PXI Express filler panels.
- (NI PXIe-4112/4113 Only)** Connect the required auxiliary 48 V power source to the auxiliary power input connector of the device using an AC power cord, as illustrated in Figure 2, then tighten the screws to hold the auxiliary 48 V power source connector in place on the device front panel.



Note To use the NI PXIe-4112/4113, you *must* connect the auxiliary 48 V power source that ships with the device. For more information, refer to the *Auxiliary Power* topic for your device in the *NI DC Power Supplies and SMUs Help*.

Figure 2. Connecting the Auxiliary 48 V Power Source to the NI PXIe-4112/4113



1 Required Auxiliary 48 V Power Source



Note The required auxiliary 48 V power source provided by NI uses sufficient wire gauge to maintain voltage requirements for the device. If you use a third-party auxiliary power source, you must use the appropriate wire gauge to ensure that it can provide the required device current without dropping below the minimum voltage at the auxiliary power input connector. Refer to the *NI DC Power Supplies and SMUs Help* for more information about wire gauge.



Note The NI PXIe-4112/4113 also ships with four sense jumpers installed on the device. For more information, refer to the [Sense Jumpers \(NI PXIe-4112/4113 Only\)](#) section in this document.

12. Plug in and power on the PXI/PXI Express chassis.
13. **(External Controller Only)** If you are using an external controller instead of an embedded controller, power on the controller.

Uninstalling the NI Power Supply or SMU



Hot Surface NI power supplies and SMUs may become hot during operation. Hold the device by the ejector handle and front panel *only* when removing it from the chassis or when moving it to a different peripheral slot.

When removing the NI power supply or SMU from the chassis, verify that you have first removed all front panel connections to the device and that you are grounded with a grounding strap or are touching a grounded metal surface. To avoid ESD, do *not* touch the exposed connector pins or any exposed circuitry on the device. When not in use, store the device in its antistatic envelope to avoid damage.

6. Configuring and Testing in MAX

To configure and test the NI power supply or SMU in Measurement & Automation Explorer (MAX), complete the following steps:

1. Launch MAX (**Start**»**All Programs**»**National Instruments**»**Measurement & Automation Explorer**). MAX automatically detects the device you installed.
2. Expand **Devices and Interfaces**. If you are using a remote real-time (RT) target, expand **Remote Systems**, find and expand the target, and then expand **Devices and Interfaces**.
3. Expand the listing for your chassis.

4. Verify that the NI power supply or SMU appears under the appropriate chassis. If your chassis does not appear under **Devices and Interfaces**, refer to the chassis documentation to identify the chassis.



Note If the device does not appear, press <F5> to refresh the view in MAX. If the device still does not appear, repeat the steps in section 5. *Installing the Hardware*. Refer to NI Technical Support at ni.com/support for troubleshooting information if the device is still not recognized. For more information about using MAX, refer to the available help files within MAX.

5. Record the device name assigned to the NI power supply or SMU. You need this name for programming the device.
The assigned device name is appended to the device in its configuration tree label. For example, after you install the NI PXI-4132, the device configuration tree label may appear as NI PXI-4132: "Dev1", where *Dev1* is the device name that MAX assigned to the module. When you develop your application, the **resource name** for the NI PXI-4132 is this device name. To change the device name, complete the following steps:
 - a. Right-click the device you want to rename. Select **Rename**.
 - b. Enter the new name. Press <Enter>.
6. To perform a self-test on the device to verify installation, right-click the device name in MAX and select **Self-Test**. If an error occurs, refer to ni.com/support for troubleshooting information.
7. Launch the NI-DCPower Soft Front Panel (SFP) to run functional tests and to use the device. You can launch the NI-DCPower SFP from **Start»All Programs»National Instruments»NI-DCPower»NI-DCPower Soft Front Panel**, or right-click the device name in the MAX configuration tree and select **Test Panels**, or select **Tools»Soft Front Panels»NI-DCPower Soft Front Panel** in MAX.
8. Close the NI-DCPower SFP
9. Close MAX.

7. Connecting Signals



Caution Always refer to the specifications document included with the NI power supply or SMU *before* connecting signals. Failure to observe the specified maximum signal ratings can cause shock, a fire hazard, or damage to the devices connected to the NI power supply or SMU. NI is not liable for any damage or injuries resulting from incorrect signal connections.

Front connectors on most NI power supplies and SMUs are removable. Refer to the *NI DC Power Supplies and SMUs Help* for information about connecting signals to specific devices.

Connecting Optional Auxiliary 12 V Power (NI PXI-4110/4130 Only)

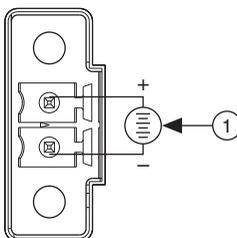
For NI power supplies or SMUs that support the connection of an optional auxiliary 12 V power source, refer to the following recommendations:

- To gain full output power of the isolated channel(s) on the device, you *must* connect an auxiliary 12 V power source to the auxiliary power input connector of the device, as illustrated in Figure 3.



Caution For internal and auxiliary power ratings, refer to the specifications for your device at **Start»All Programs»National Instruments»NI-DCPower»Documentation**.

Figure 3. Connecting an Optional Auxiliary 12 V Power Source to an NI Power Supply or SMU



1 Optional Auxiliary 12 V Power Source

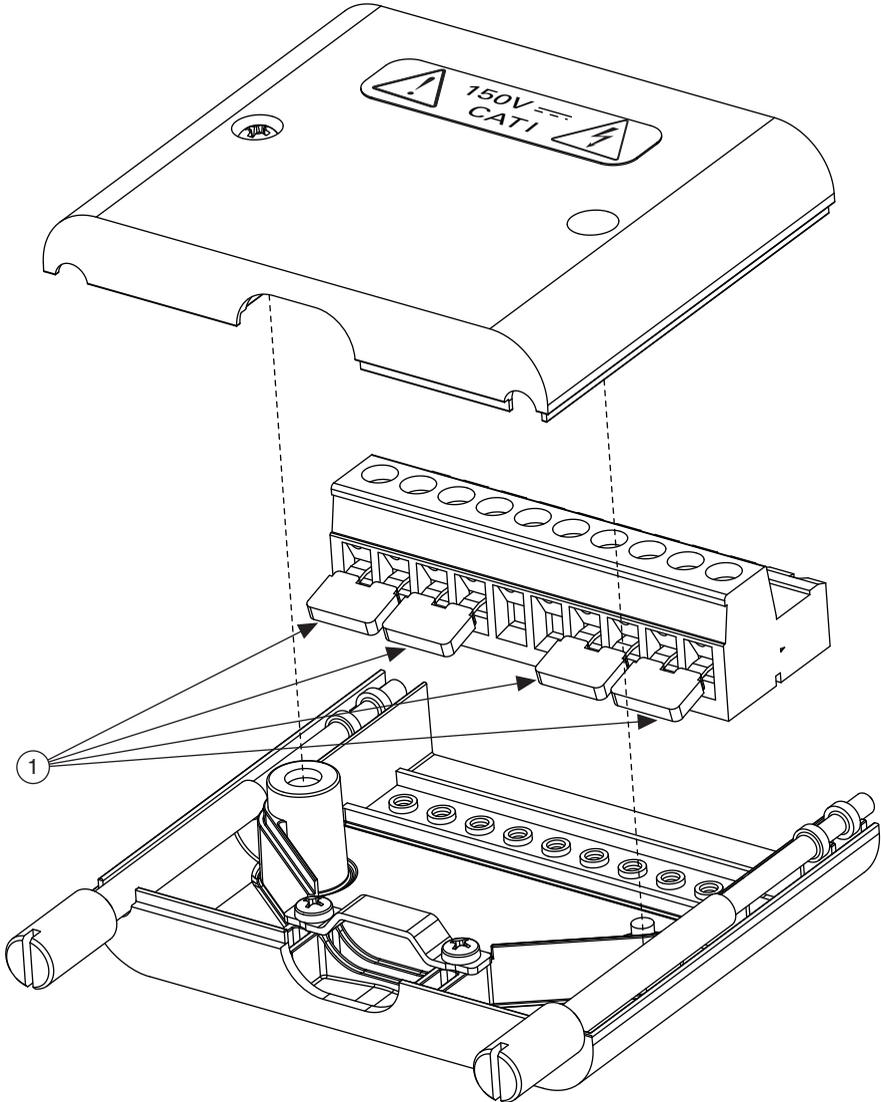
- NI-DCPower automatically uses the optional auxiliary 12 V power source, if it is available, when the session is opened. To override this feature, use the Power Source property or the `NIDCPOWER_ATTR_POWER_SOURCE` attribute.
- The optional auxiliary 12 V power source provided by NI uses sufficient wire gauge to maintain voltage requirements for the device. If you use a third-party auxiliary power source, you must use the appropriate wire gauge to ensure that it can provide the required device current without dropping below the minimum voltage at the auxiliary power input connector. Refer to the *NI DC Power Supplies and SMUs Help* for more information about wire gauge.

For more information about using an optional auxiliary 12 V power source with your NI power supply or SMU, refer to the *Internal and Auxiliary Power* topic in the *NI DC Power Supplies and SMUs Help* at **Start»All Programs»National Instruments»NI-DCPower»Documentation**.

Sense Jumpers (NI PXIe-4112/4113 Only)

The NI PXIe-4112/4113 ships with four sense jumpers installed to enable operation using a single set of leads for each channel. These sense jumpers connect the sense terminals to their respective output terminals, as illustrated in the following figure.

Figure 4. Sense Jumpers Installed on the NI PXIe-4112/4113



1 Sense jumpers between S_{\pm} and Out_{\pm} pins



Note The NI PXIe-4112/4113 requires these sense jumpers to operate with a single set of leads for each channel. To operate in a remote sense configuration with two sets of leads for each channel, remove these sense jumpers and connect the leads between the sense terminals and the load.

Refer to the *Local and Remote Sense* topic for your device in the *NI DC Power Supplies and SMUs Help* for more information about this configuration.

8. Programming the NI Power Supply or SMU

You can acquire data interactively using the NI-DCPower SFP or programmatically using the NI-DCPower instrument driver in your application. You can also run the NI-DCPower examples to demonstrate the functionality of the power supply or SMU.

Acquiring Data Interactively

Launch the NI-DCPower SFP from **Start»All Programs»National Instruments»NI-DCPower»NI-DCPower Soft Front Panel**. The NI-DCPower SFP provides context-sensitive help for its controls.

Acquiring Data Programmatically

You can use NI-DCPower to begin programming the NI power supply or SMU in your ADE.

For detailed instructions about how to acquire data in a specific ADE, refer to the *Getting Started* section of the *NI DC Power Supplies and SMUs Help* located at **Start»All Programs»National Instruments»NI-DCPower»Documentation»NI DC Power Supplies and SMUs Help»Programming»Getting Started**.

NI-DCPower Examples

Examples demonstrate the functionality of the device, serving as programming models and building blocks for your own applications. The NI Example Finder is a utility available for some software applications that organizes examples into categories and allows you to easily browse and search installed examples. You can see descriptions and compatible hardware models for each example or see all the examples compatible with one particular hardware model.

To locate examples, refer to the following table.

Software Application	Locating Examples
LabVIEW or LabWindows/CVI	Locate examples with the NI Example Finder. Within LabVIEW or LabWindows/CVI, select Help»Find Examples and navigate to Hardware Input and Output»Modular Instruments»NI-DCPower (DC Power Supplies) .

Appendix A: Troubleshooting

For troubleshooting information, refer to the *NI DC Power Supplies and SMUs Help at **Start**»**All Programs**»**National Instruments**»**NI-DCPower**»**Documentation***.

Appendix B: Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

CVI, LabVIEW, National Instruments, NI, ni.com, the National Instruments corporate logo, and the Eagle logo are trademarks of National Instruments Corporation. Refer to the *Trademark Information* at ni.com/trademarks for other National Instruments trademarks. The mark LabWindows is used under a license from Microsoft Corporation. Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patents Notice* at ni.com/patents. You can find information about end-user license agreements (EULAs) and third-party legal notices in the NI-DCPower Readme. Refer to the *Export Compliance Information* at ni.com/legal/export-compliance for the National Instruments global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data.