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**PXI-6031E**

# INSTALLATION GUIDE

# BNC-2115

## Desktop and DIN Rail-Mountable BNC Adapter for E Series Devices

This installation guide describes how to install and configure your BNC-2115 accessory. If you have not already installed your DAQ device, refer to the *DAQ Quick Start Guide* for instructions.

The BNC-2115 is a desktop and DIN rail-mountable BNC adapter you can connect to data acquisition (DAQ) devices. The BNC-2115 includes 24 BNC connectors and a two-position screw terminal.

The BNC-2115 has one 68-pin connector on the rear panel to connect to your DAQ device. The 68-pin I/O connector connects to the extended analog input of 64-channel Multifunction DAQ devices and the extended digital I/O (DIO) of Multifunction DAQ devices. The BNC-2115 is ideal for simplifying connections between your measurement apparatus and your DAQ device in laboratory, test, and production environments.

## What You Need to Get Started

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To set up and use your BNC-2115 accessory, you need the following:

- ☐ BNC-2115 BNC adapter
- ☐ *BNC-2115 Installation Guide*
- ☐ SH1006868 cable
- ☐ One of the following Multifunction DAQ devices:
  - NI PCI-6033E
  - NI PCI/PXI-6025E
  - NI PCI/PXI-6031E
  - NI PCI/PXI-6071E
  - NI AT-MIO-64E-3
  - NI AT-MIO-16DE-10

For detailed specifications for the BNC-2115, refer to the *Specifications* section.



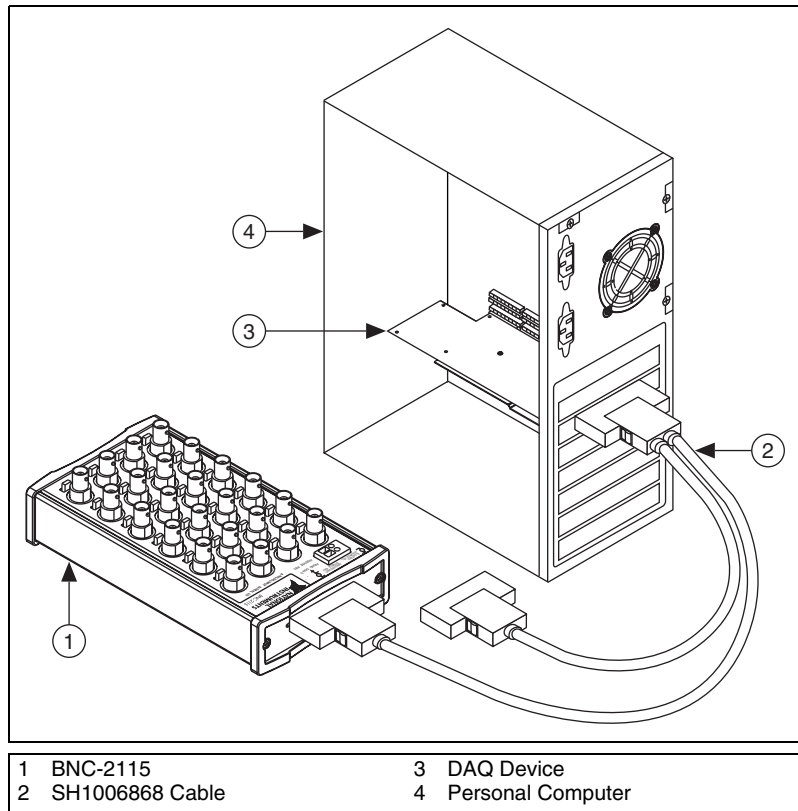
**Caution** Do *not* connect the BNC-2115 to any device other than the National Instruments devices listed previously. Doing so can damage the BNC-2115, the DAQ device, or the host computer. National Instruments is *not* liable for damage resulting from these connections.

## Installing the BNC-2115

To connect the BNC-2115 to your DAQ device, refer to Figure 1 as you complete the following steps. Consult your computer user manual or technical reference manual for specific instructions and warnings.



**Note** If you have not already installed your DAQ device, refer to the *DAQ Quick Start Guide* for instructions.



**Figure 1.** Connecting the BNC-2115 to Your DAQ Device

1. Place the BNC-2110 near the host computer or use the optional DIN rail-mounting kit, which you can order from National Instruments. For more information about the DIN rail-mounting kit, refer to the National Instruments Web site at [ni.com](http://ni.com) or call the office nearest you.
2. With your DAQ device powered off, connect the BNC-2115 to your DAQ device with the extended I/O end of the SH1006868 cable.
3. Make sure the floating source (FS)/ground-referenced source (GS) switches under BNC connectors AI <16..55> are set correctly for your application. National Instruments recommends that you set the switches to GS for analog output and digital signals.
4. Connect the field signals to the BNC connectors and/or digital screw terminal plugs. Refer to the *Connecting Signals to the BNC-2115* section for more information.
5. Refer to the *DAQ Quick Start Guide* to launch Measurement & Automation Explorer (MAX), confirm that your device is recognized, and configure your device settings. National Instruments recommends that you use your DAQ device in differential mode when using the BNC-2115.
6. Test specific device functionality, such as the ability to send and receive data. Refer to the *DAQ Quick Start Guide* for more detailed information on running test panels in MAX.

When you have finished using the BNC-2115, power off any external signals connected to the BNC-2115 before you power off the computer.



**Caution** The BNC-2115 is not designed for input voltages greater than 42 V, even if a user-installed voltage divider reduces the voltage to within the input range of the DAQ device. Input voltages greater than 42 V can damage the BNC-2115, any device connected to it, and the host computer. Overvoltage also can cause an electric shock hazard for the operator. National Instruments is *not* liable for damage or injury resulting from misuse.

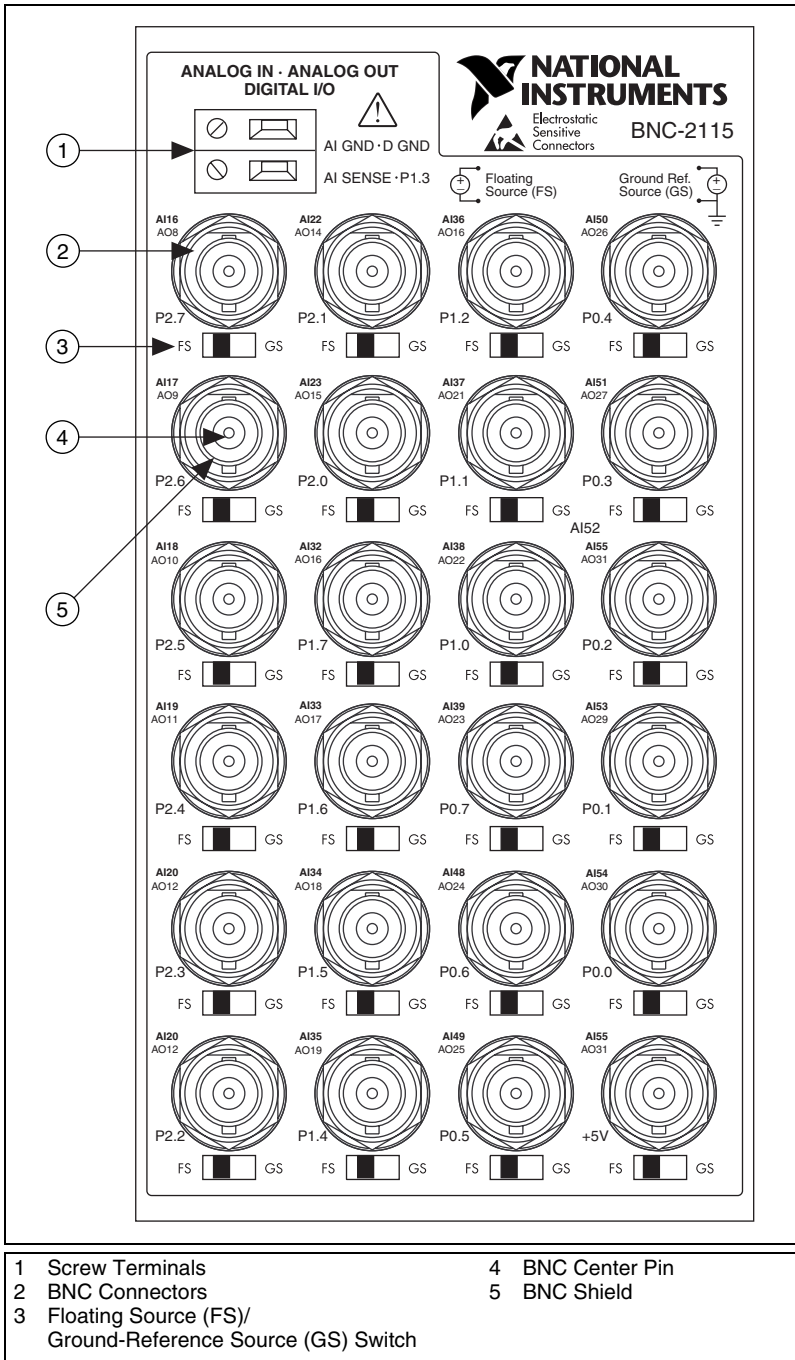
## Connecting Signals to the BNC-2115

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This section describes how to configure the BNC-2115. Figure 2 shows the front panel of the BNC-2115



**Note** With NI-DAQmx, National Instruments has revised its terminal names so they are easier to understand and more consistent among NI hardware and software products. The revised terminal names used in this document are usually similar to the names they replace. For a complete list of traditional NI-DAQ terminal names and their NI-DAQmx equivalents, refer to the *Terminal Name Equivalences* table in the *E Series Help* at [ni.com/manuals](http://ni.com/manuals).



**Figure 2.** BNC-2115 Front Panel

To connect AI signals to the NI PCI/PXI-60XXE and AT-MIO-64E-3 devices using the AI <16..55> BNC-2115 connectors, refer to the *Connecting Analog Input Signals* section.

To connect DIO signals to the NI PCI/PXI-6025E and AT-MIO-16DE-10 devices using the P0.<0..7>, P1.<0..7>, and P2.<0..7> BNC-2115 connectors, refer to the *Connecting Digital I/O Signals* section.

## Connecting Analog Input Signals

National Instruments recommends that you use the BNC-2115 in differential mode. If you need more analog inputs in your application than are available using differential mode, you can configure your DAQ device in single-ended mode and double the number of analog input channels. Refer to the *Operating the BNC-2115 in Single-Ended Mode* section for details. You can use the BNC-2115 to measure floating and ground-referenced analog input signals in differential mode.

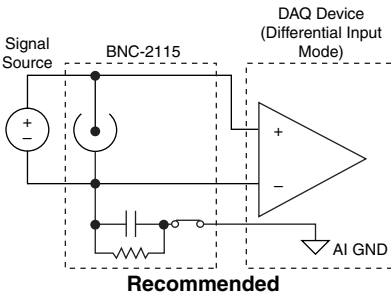
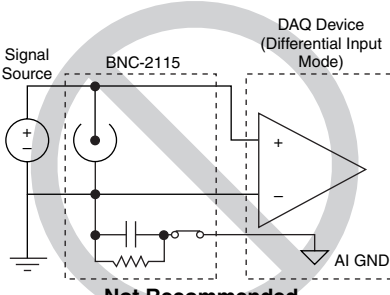
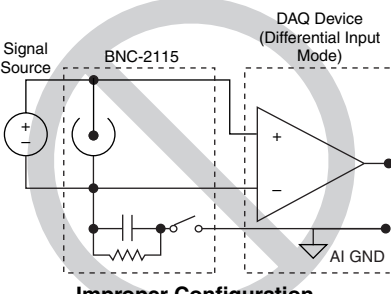
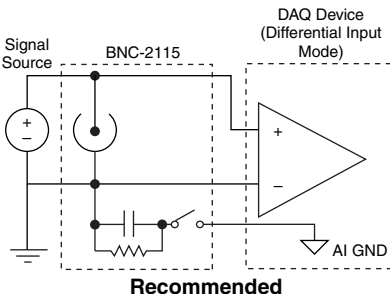
## Measuring Floating Signal Sources

To measure floating signal sources, move the switch located below the applicable analog input BNC to the floating source switch position labeled FS. In the floating source switch position, the amplifier negative terminal is connected to ground using a 5 k $\Omega$  resistor in parallel with a 0.1  $\mu$ F capacitor. Table 1 shows the BNC-2115 switch configuration options.



**Note** Measuring floating signal sources, such as isolated battery-powered equipment, with the GS setting results in incorrect measurements.

**Table 1.** Configuration Summary

BNC-2115 Switch Configuration	Signal Source Types	
	Floating Source	Ground-Referenced Source
Floating Source (FS)	 <p><b>Recommended</b></p>	 <p><b>Not Recommended</b></p>
Ground-Referenced Source (GS)	 <p><b>Improper Configuration</b></p>	 <p><b>Recommended</b></p>

## Measuring Ground-Referenced Signals

To measure ground-referenced signals, move the switches to either the floating or ground-referenced source position. However, for best performance, use the ground-referenced source position labeled GS to avoid ground loops. Refer to your DAQ device documentation for more information on measuring floating and ground-referenced signals.

The BNC-2115 connectors AI <16..55> correspond to the device differential analog channels 16 to 55.

Table 2 describes the two-position terminal block signals on the front panel of the BNC-2115.

**Table 2.** BNC-2115 Two-Position Terminal Block Signal Descriptions

Two-Position Terminal Block Connector	Signal Description
AI GND	Analog Input Ground—The analog input voltages are referenced to this node.
AI SENSE	Analog Input Sense—This pin serves as the reference node for channels AI <16..63> in NRSE configurations.

## Connecting Analog Output Signals

National Instruments recommends that you set the switches to the ground-referenced (GS) position when measuring analog output signals. The AO <8..31> channels correspond with the AI <16..33>, AI <32..39>, and AI <48..55> connectors. For details on how each AO signal corresponds to each AI signal, refer to Figure 2.

## Connecting Digital I/O Signals

Use the BNC connectors and the two-position screw terminal to connect your digital signals to your DAQ device. The DIO signal can be accessed on the center pin of the applicable BNC connector, while digital ground can be accessed on the outer shield of the BNC connector. Tables 3 and 4 describe the connectors for digital signals on the front panel of the BNC-2115.

**Table 3.** BNC-2115 BNC Connections for Extended DIO Accessory

Front Panel BNC Connectors	Signal Description
P2.<0..7>	Bidirectional DIO Port 2, channels 0 through 7
P1.<0..7>	Bidirectional DIO Port 1, channels 0 through 7 <sup>1</sup>
P0.<0..7>	Bidirectional DIO Port 0, channels 0 through 7
<sup>1</sup> You also can connect to P1.3 through a terminal block screw connector. Refer to Table 4.	



**Table 4.** BNC-2115 Two-Position Terminal Block Connections for Extended DIO Accessory

Two-Position Terminal Block Connector	Signal Description
D GND	Digital Ground—This pin supplies the reference for the digital signals at the I/O connector as well as the +5 VDC supply.
P1.3	Port 1 line 3—This is the bidirectional DIO line for Port 1.

To connect DIO signals to the NI PCI-60XXE and NI AT-MIO-64E-3 devices, use the AI <16..55> BNC-2115 connectors. To connect DIO signals to the NI PCI-6025E and NI AT-MIO-16DE-10 devices, use the P0.<0..7>, P1.<0..7>, and P2.<0..7> BNC-2115 connectors.

For more detailed information about how the accessory terminals correspond one-to-one to the Multifunction DAQ device, refer to the *I/O Connector Pinouts Table* in the *E Series Help* at [ni.com/manuals](http://ni.com/manuals).

## Operating the BNC-2115 in Single-Ended Mode

You can increase the number of analog input channels by configuring the DAQ device analog input to operate in either referenced single-ended (RSE) mode, or nonreferenced single-ended (NRSE) mode. In either of these modes, each BNC coaxial cable carries two single-ended channels, instead of one differential channel.

To configure the analog input using Traditional NI-DAQ, open Measurement & Automation Explorer (MAX), open **Devices and Interfaces»Traditional NI-DAQ Devices**, then right-click the icon for your device. Select **Properties** from the menu, then click the **AI** tab and change the analog input (AI) mode to RSE or NRSE.

To configure input terminals using NI-DAQmx, use the DAQ Assistant or the NI-DAQmx API. For more information, refer to the *DAQ Assistant Help* and the *Measurement and Automation Explorer Help for NI-DAQmx*.

Table 5 shows the connections that you need to make.

**Table 5.** Analog BNC Pairs

<b>BNC Center Pin</b>	<b>BNC Outer Shield</b>	<b>Signal Reference</b>	<b>Ground Reference</b>
AI 16	AI 24	AI SENSE	AI GND
AI 17	AI 25	AI SENSE	AI GND
AI 18	AI 26	AI SENSE	AI GND
AI 19	AI 27	AI SENSE	AI GND
AI 20	AI 28	AI SENSE	AI GND
AI 21	AI 29	AI SENSE	AI GND
AI 22	AI 30	AI SENSE	AI GND
AI 23	AI 31	AI SENSE	AI GND
AI 32	AI 40	AI SENSE	AI GND
AI 33	AI 41	AI SENSE	AI GND
AI 34	AI 42	AI SENSE	AI GND
AI 35	AI 43	AI SENSE	AI GND
AI 36	AI 44	AI SENSE	AI GND
AI 37	AI 45	AI SENSE	AI GND
AI 38	AI 46	AI SENSE	AI GND
AI 39	AI 47	AI SENSE	AI GND
AI 48	AI 56	AI SENSE	AI GND
AI 49	AI 57	AI SENSE	AI GND
AI 50	AI 58	AI SENSE	AI GND
AI 51	AI 59	AI SENSE	AI GND
AI 52	AI 60	AI SENSE	AI GND
AI 53	AI 61	AI SENSE	AI GND
AI 54	AI 62	AI SENSE	AI GND
AI 55	AI 63	AI SENSE	AI GND

# Specifications

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This section lists the specifications of the BNC-2115. These specifications are typical at 25 °C unless otherwise specified.

Field connection .....	24 BNC connectors
Screw terminal .....	2-pin

## Physical

Dimensions .....	19.05 by 10.48 by 3.51 cm (7.5 by 4.125 by 1.38 in.)
I/O connector .....	68-pin male connector
BNC connectors.....	24
Screw terminal plugs .....	2

## Environment

Operating temperature .....	0 to 70 °C
Storage temperature .....	–55 to 125 °C
Relative humidity .....	5 to 90% noncondensing

## Safety

The BNC-2110 meets the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 3111-1, UL 61010B-1
- CAN/CSA C22.2 No. 1010.1



**Note** For UL and other safety certifications, refer to the product label or to [ni.com](http://ni.com).

# Electromagnetic Compatibility

Emissions .....	EN 55011 Class A at 10 m FCC Part 15A above 1 GHz
Immunity .....	EN 61326:1997 + A2:2001, Table 1
EMC/EMI .....	CE, C-Tick, and FCC Part 15 (Class A) Compliant



**Note** For EMC compliance, you *must* operate this device with shielded cabling.

## CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety) ..... 73/23/EEC

Electromagnetic Compatibility  
Directive (EMC) ..... 89/336/EEC



**Note** Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, click **Declarations of Conformity Information** at [ni.com/hardref.nsf/](http://ni.com/hardref.nsf/). This Web site lists the DoCs by product family. Select the appropriate product family, followed by your product, and a link to the DoC appears in Adobe Acrobat format. Click the Acrobat icon to download or read the DoC.

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