

INSTALLATION GUIDE

BNC-2096

The BNC-2096 is a 16-channel rack-mount adapter for reading IEEE P1451.4 Transducer Electronic Data Sheet (TEDS) information from Class I TEDS sensors.

The BNC-2096 has the following features:

- 16 TEDS-capable input channels
- E Series data acquisition (DAQ) device control through a 68-pin connector
- NI 4021 control through a 10-pin auxiliary (AUX) connector
- 10-pin pass-through AUX connector for digital control of multiple BNC-2096 devices with one control device
- External power option
- 5-bit addressing for using multiple adapters
- 19 in. rack-mount housing
- Software support with a LabVIEW TEDS VI library

Conventions

The following conventions are used in this guide:

»

The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

<>

Angle brackets that contain numbers separated by an ellipsis represent a range of values associated with a bit or signal name—for example, AI<0..7>.



This icon denotes a note, which alerts you to important information.



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. When this symbol is marked on

the product, refer to the *Read Me First: Safety and Radio-Frequency Interference* document, shipped with the product, for precautions to take.

bold	Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
<i>italic</i>	Italic text denotes variables, emphasis, a cross reference, a hardware label, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.
monospace	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

What You Need to Get Started

To set up and use the BNC-2096, you need the following items:

- ☐ Software
 - NI-DAQmx 7.2 or later for Windows 2000/NT/XP
- ☐ Hardware
 - BNC-2096
 - 68-pin E Series device or NI 4021
 - NI 447X or NI PXI-4461 Dynamic Signal Acquisition (DSA) device, or SCXI subsystem with SCXI-153X¹
 - One or more Class I TEDS sensors for TEDS capability
 - BNC-2096 external power adapter (if using more than one BNC-2096)
- ☐ Documentation
 - *BNC-2096 Installation Guide*
 - *Read Me First: Safety and Radio-Frequency Interference*
 - E Series, NI 447X, NI PXI-4461, SCXI-153X, or NI 4021 documentation
 - *DAQ Quick Start Guide*

¹ Although any DAQ device with BNC connectivity can read the analog sensor data from the BNC-2096, NI recommends using devices designed for maximum sensitivity and dynamic range when measuring signals from microphones and accelerometers such as the NI 447X, SCXI-153X, and NI PXI-4461.

- ❑ Tools
 - 1/8 in. flathead screwdriver
- ❑ Cables
 - 68-pin cable or AUX cable
 - BNC-to-BNC cables
 - BNC-to-SMB cables (for use with the NI 447X)

If you do not have NI-DAQmx 7.2 or later, or one of the documents, you can download them from ni.com, or contact an NI sales representative.

TEDS Related Information

You can find more TEDS information in the following locations:

- *Measurement & Automation Explorer Help for NI-DAQmx and NI-DAQmx Help*
- ni.com/info and enter any of the following info codes:
 - `rdsenr`
 - `rdpnpy`
 - `rdpnsn`
 - `rdted6`
 - `rdrsc1`

Theory of Operation



Caution Refer to the *Read Me First: Safety and Radio-Frequency Interference* document before removing equipment covers or connecting/disconnecting any signal wires. Refer to the [Specifications](#) section for important safety and compliance information

Figure 1 shows the BNC-2096 and important locations on the adapter.

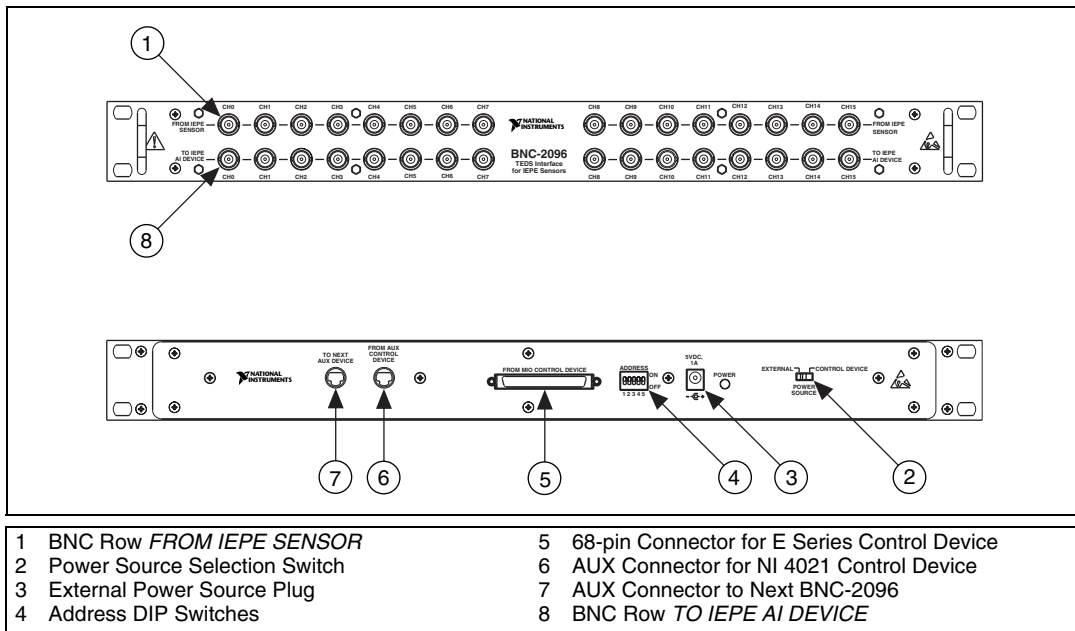


Figure 1. BNC-2096 Parts Location Diagram

Figure 2 diagrams the operation of the BNC-2096.

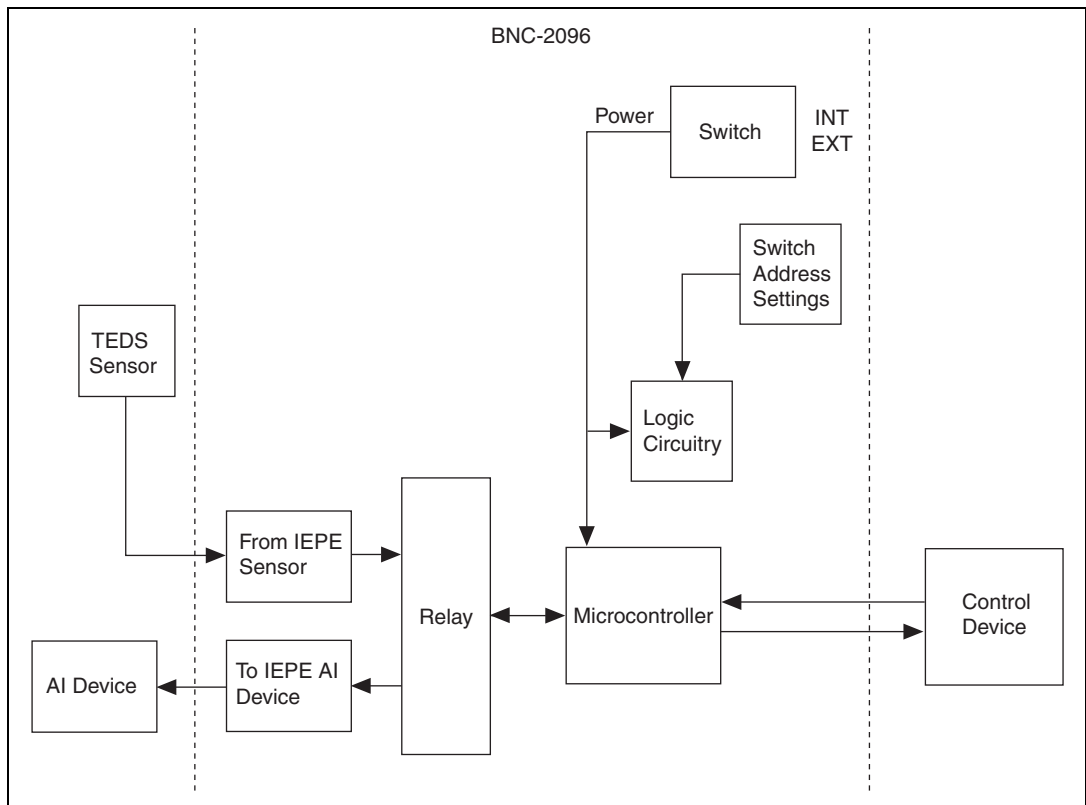


Figure 2. BNC-2096 Operational Block Diagram

The BNC-2096 uses a microcontroller to communicate to the TEDS sensor. The BNC-2096 interfaces with a TEDS Class I sensor as part of a data acquisition system. This system includes TEDS sensors, a control device, one or more BNC-2096 adapters, and one or more analog input (AI) devices. The control device acts as the master device and handles all of the configuration requests between the BNC-2096, AI device, and the TEDS sensor. The BNC-2096 acts as the slave device by accepting commands from the control device and setting the correct channel mode, as well as interfacing with the TEDS sensor. The AI device measures the physical sensor signal.



Note You can use Virtual TEDS sensors along with TEDS sensors as part of the measurement system. The BNC-2096 passes the data directly to the acquisition device. For more information about Virtual TEDS go to ni.com/sensors.

The BNC-2096 has two modes of operation: analog pass-through and TEDS mode. The default channel status of all channels on the BNC-2096 is analog pass-through. While in analog pass-through mode the BNC-2096 passes the analog signal between the TEDS sensor and an analog channel on the AI device.

When a sensor is asked by a software command to send digital TEDS data back to the control device, the channel status is changed to TEDS mode. This mode allows the TEDS sensor to send and receive data. Once the sensor sends the data to the control device the channel switches back to analog mode. When the BNC-2096 returns to analog mode you can acquire a signal from the sensor again. While the TEDS sensor is in TEDS mode the analog channel is disconnected and you cannot acquire a valid signal with the AI device.



Note NI recommends stopping all analog acquisitions before switching any channel to TEDS mode.

Figure 3 diagrams the TEDS modes and how they affect the BNC-2096.

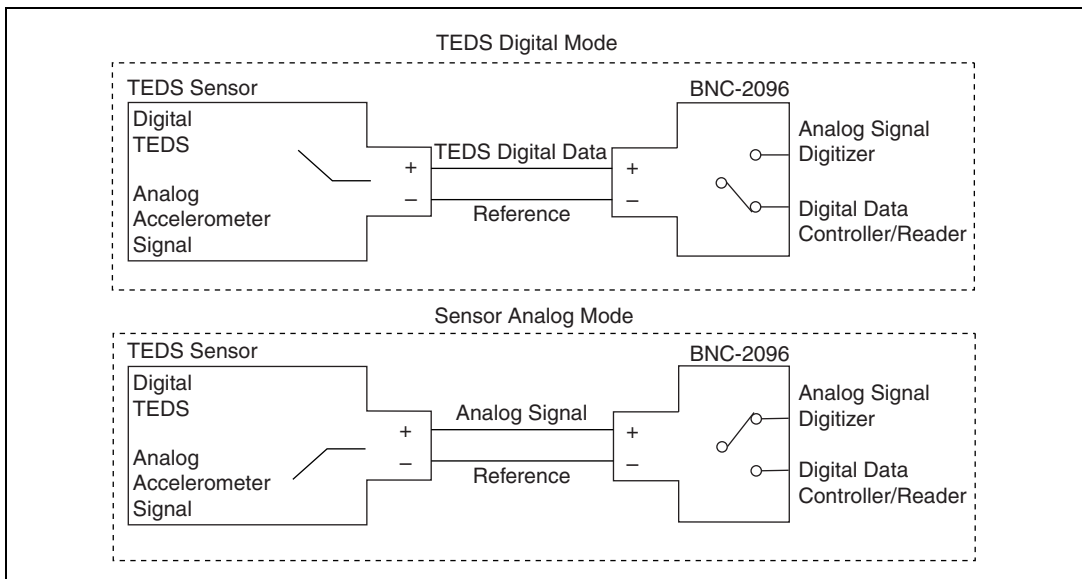


Figure 3. Analog and Digital Modes of Operation

Addressing the BNC-2096

You can connect up to eight BNC-2096 adapters to one control device with the AUX connectors and external power adapters. Each BNC-2096 is assigned a unique address and each channel is addressed sequentially. You can set the BNC-2096 address with a series of DIP switches on the back of the adapter. Refer to Figure 1 for the location of the DIP switches.



Note The address data is binary. To select address 19, for example, you must set switches 4 and 3 to the *OFF* position.

Refer to Figure 4 for an example of how to use the address DIP switches.

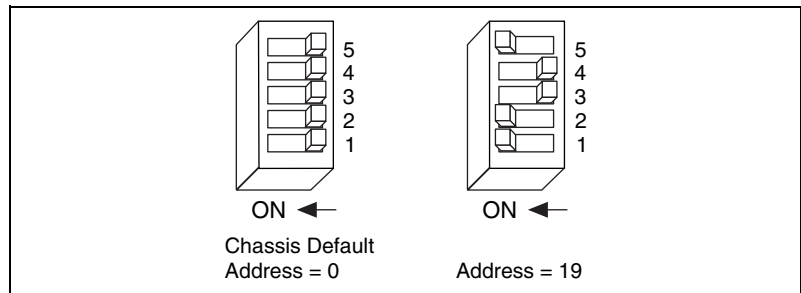


Figure 4. Address Setting Examples

You can only power one BNC-2096 with the control device. You must connect the external power adapter to each additional BNC-2096.

Connecting Signals

This section describes how to connect signals to the BNC-2096 and other necessary components of the measurement system. Figure 5 shows an example of a measurement system with the BNC-2096 and NI 447X AI devices.

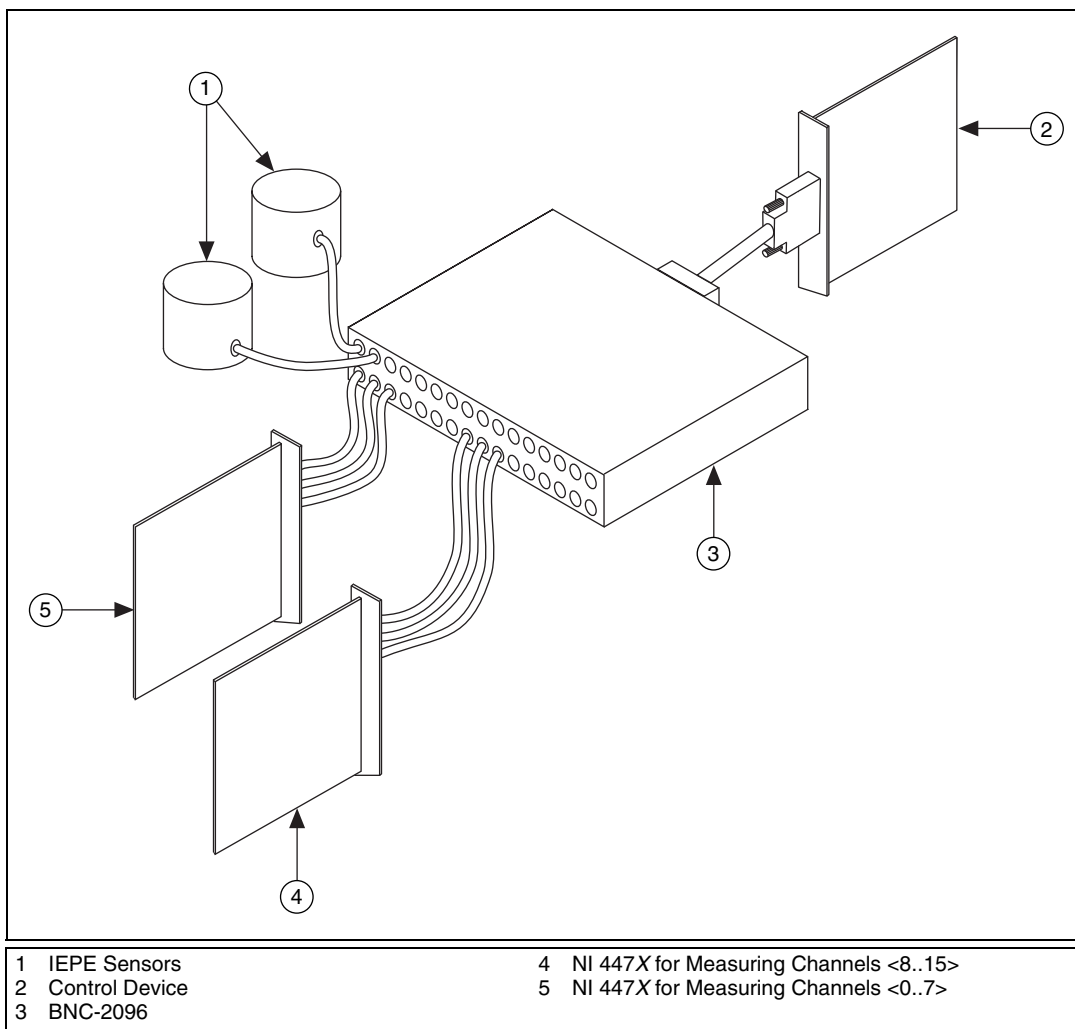


Figure 5. Connecting the BNC-2096

To connect the BNC-2096 refer to Figures 1 and 5 and complete the following steps:

1. Use either a 68-pin or an AUX cable to connect the control device to the appropriate connector on the back of the BNC-2096.
2. If you are connecting multiple BNC-2096 adapters to one control device, connect an AUX cable to the connector labeled *TO NEXT AUX DEVICE* on the previous BNC-2096 to the connector labeled *FROM AUX CONTROL DEVICE* on the next BNC-2096.



Note You may connect up to eight BNC-2096 adapters to one control device. Ensure that each BNC-2096 has a different address. You also must connect every BNC-2096 not connected to the control device to external power with the supplied adapter.

3. Using a male BNC-ended cable, connect an IEPE sensor to one of the BNC connectors CH<0..15> on the row labeled *FROM IEPE SENSOR*.
4. Using a male BNC-ended cable, connect the AI device to one of the BNC connectors CH<0..15> on the row labeled *TO IEPE AI DEVICE*.



Note Figure 5 uses two eight-channel NI 447X devices as an example of how you can connect two AI devices to read up to 16 channels through the BNC-2096.

Specifications

This section lists the specifications for the BNC-2096. These specifications are typical at 25 °C unless otherwise stated.

Analog Input

Sensor compatibility	IEEE P1451.4 Class I
Input channels	16
Maximum input voltage	Each input should remain within ± 42.4 VDC ($30 V_{\text{rms}}$) of any other input or of AI GND
Crosstalk (any combination of channels 0 to 7) from $f_{\text{in}} = 0$ to 51.2 kHz	
Shorted input	< -90 dB
1 K Ω load	< -75 dB
Maximum cable length	61 m (200 ft), typical
External addressing	23 software valid addresses
Maximum BNC-2096 per controller	8

Power Requirement

+5 VDC	50 mA
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Physical

Dimensions	48.3 by 4.4 by 18.8 cm (19.0 by 1.7 by 7.4 in.)
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I/O Connectors

I/O connections.....	32 BNC connectors
E Series control device connection.....	68-pin 0.8 VHDCI
AUX connector.....	9-pin DIN

Environmental

Operating temperature	0 to 50 °C
Storage temperature	–55 to 50 °C
Relative humidity	5% to 90%, noncondensing
Altitude	2,000 m (at 25 °C ambient temperature)
Pollution Degree (indoor use only)	2

Safety

The BNC-2096 is designed to meet the requirements of the following standards of safety for 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 visit ni.com/hardref.nsf, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

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



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

CE Compliance

The BNC-2096 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, visit ni.com/hardref.nsf, search by model number or product line, and click the appropriate link in the Certification column.

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.

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