

Main Page : DAQ Multifunction I/O Cable Guide

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Overview

Use this **guide** to better understand specifications and differences, and answer common questions about using National Instruments cables with your DAQ devices and modules. This **guide** discusses NI naming terminology, repairing or making a custom cable, addressing noise and unexpected signals, finding information such as signal mapping and pinouts, and choosing the right cable to meet your needs—from low cost ribbon cables to high performance noise reducing, shielded, and more.

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Using the DAQ Cable and Accessory Guides

This **guide** is intended to cover cables designed for use with NI DAQ devices, and their use cases. It does not cover use with other NI product families such as [Digital Instruments \(formerly HSDIO\)](#), C Series, or R Series, although some may use similar or the same cables. It also does not cover legacy or End of Life (EOL) NI DAQ cables.

If you seek information about a specific cable, NI recommends that you first review this page and its more general information to better understand the product offerings, and then jump to the page for your specific model.

- To find more detailed information about your DAQ cable pinout and mappings, color codes, wire gauge, dimensional drawings, mating connector, shielding and more, visit the linked cable **guides** in [NI DAQ Cables Connectivity and Features](#).
- To learn more about compatibility between your NI DAQ accessory or cable and your NI DAQ device or module, visit [Main Page : DAQ Multifunction I/O Cable and Accessory Compatibility](#).
- To learn more about NI DAQ accessories to use with your NI DAQ device or cable, visit [Main Page : DAQ Multifunction I/O Accessory Guide](#).
- To create your own cable or test fixture, or to repair an existing NI DAQ cable or accessory, visit [NI DAQ Device Custom Cables, Replacement Connectors, and Screws](#).

Understanding NI Cable Terminology

NI cables come in a variety of options and functionality. This section briefly explains what some of those acronyms and other terminology means. To learn more about a specific cable, visit the [DAQ Cable Guide Page](#) for your cable, or its product page.

Anatomy of a Model Name

Use this section to better understand your NI accessory's model name and numbering.

Thank you for your feedback.

- **SHC** - Shielded cables with a "compact" 0.8 mm VHDCI connector on the end that connects to the device or module.
- **SH** - Shielded cables with a SCSI 0.050 D-Type connector, in most cases, on the end that connects to the device or module. Some SH cables instead use D-Sub connectors.
- **RC** - Ribbon (unshielded) cables with a "compact" 0.8 mm VHDCI connector on the end that connects to the device or module.
- **R** - Ribbon (unshielded) cables with a SCSI 0.050 D-Type connector on the end that connects to the device or module.
- **DB** - Shielded cables with a D-Sub connector on the end that connects to the device or module.

Thank you for your feedback.

Most cable models will include two numbers, indicating the pin counts of the mating connectors found on each end.

- **First number** - Common DAQ connectors are 37-, 68-, and 100- for 37-pin, 68-pin, and 100-pin connectors, respectively, found on the device end of the cable,
- **Second Number** -
 - **Common DAQ connectors:** -37, -68, and -100 for 37-pin, 68-pin, and 100-pin connectors, respectively, found on one the accessory end of the cable.
 - **Conversion Cables** - Some connectors have a lower pin count on the accessory end. These conversion cables typically ground some signals, and are used for backwards compatibility between devices/modules and accessories.
 - **VHDCI Accessory Connector** - Most VHDCI DAQ cables feature a SCSI connector on the accessory end. However, some special cables such as -C68 use the 'C' to indicate the "Compact" VHDCI connector, and are for use with third party or custom PCB breakouts and terminal blocks.
 - **Right angle connector** - For use in enclosures, cables such as '68R1' the 'R' is used to indicate a right angle connector.
 - **Split Cables** - These cables include two extra numbers, such as -68-68 or -50-50, of a lower pin count. These provide convenience in using popular accessories of a different pin count.

Thank you for your feedback.

- **-EPM** - The latest generation enhanced performance cable offers an advanced design for superior noise performance and reduced crosstalk. They feature separate digital and analog sections, a double-grounded shield, individually shielded analog outputs, individually shielded twisted pairs for all analog input, and twisted pairs for critical digital I/O. EPM Cables are specifically designed for optimal performance for NI 63xx (X Series) and NI 62xx (M Series) and other new MIO DAQ devices.
- **-EP** - The previous generation of enhanced performance cable offers improved noise reduction and reduced crosstalk. For all new applications, -EPM cables are recommended and will work as drop-in replacements.
- **-S** - Wire pairings designed specifically for switching and motion applications and only recommended for specific DAQ applications.
- **-D** - Wire pairings designed specifically for counter/timer (TIO) applications and other specific DAQ applications.
- **-A2** - Wire pairings designed specifically for Analog Output (AO) applications and other specific DAQ applications.
- **-P** - Pigtail cable offering soldered pigtail ends for custom connectivity or breakout for a DAQ device.

Identifying Common NI DAQ Cable Mating Connector Types and Their Pinout

Use this section to help identify the connector type found on your cable. To create a custom cable or for more information on replacement connectors, jackscrews or jacksockets for your NI DAQ cable, use the information found throughout this guide, as well as [NI DAQ Device Custom Cables, Replacement Connectors, and Screws](#), which includes part numbers. You can also use this pinout or mapping information when creating a custom PCB breakout fixture or terminal block.

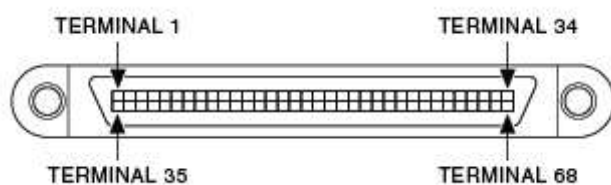
VHDCI

An improvement on a SCSI connector allowing a smaller footprint and fewer bent pins during connection. Features 0.8 mm pin spacing. Typically found on the device or module end. Most VHDCI cable models begin with SHC or RC ("C" indicating compact). Note: Many cables feature a SCSI 0.050 D-Type on the accessory end. [Learn more about common cables that use the 68-pin VHDCI connector to mate with DAQ devices or modules.](#)

VHDCI Cable Example, Connector Pinouts and Connector Info



Note: Connector image is oriented differently than pinout below.



68-Position Cable Connector Plug (Male)

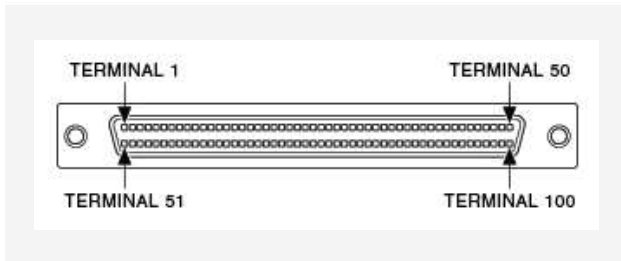
SCSI 0.050 D-Type

Industry standard SCSI connector standard featuring 0.050 pin spacing. Found on the device or module end or the accessory end. Most SCSI cable models begin with SH or R. [Learn more about common cables that use the 68-pin SCSI 0.050 D-Type connector to mate with DAQ devices or modules.](#)

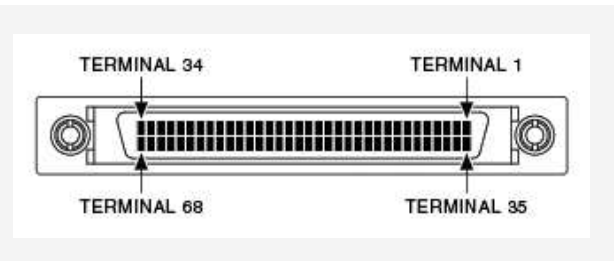
SCSI Cable Example, Connector Pinouts and Connector Info



Note: Connector image is oriented differently than pinout below.



100-Position Cable Connector Plug (Male)

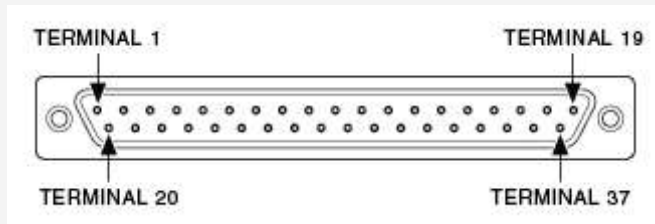


68-Position Cable Connector Receptacle (Female)

D-Sub

Industry standard D-Sub (DSUB) connector, sometimes used for higher voltage ratings. Most D-Sub cable models begin with SH or DB.

D-Sub Cable Example, Connector Pinouts and Connector Info



37-pin D-Sub Cable Connector Plug (Male)

High Performance Signal Quality - Shielding and Twisted Pairs

NI offers an array of NI DAQ cable options to meet the needs of your application. From basic unshielded ribbon cables up to cables, such as SHC-68-68-EPM, featuring specifically designed shielding and twisted pairs to deliver the optimal performance. This section explains two important features that greatly affect signal quality, shielding and twisted pairs, and why you should care about them.

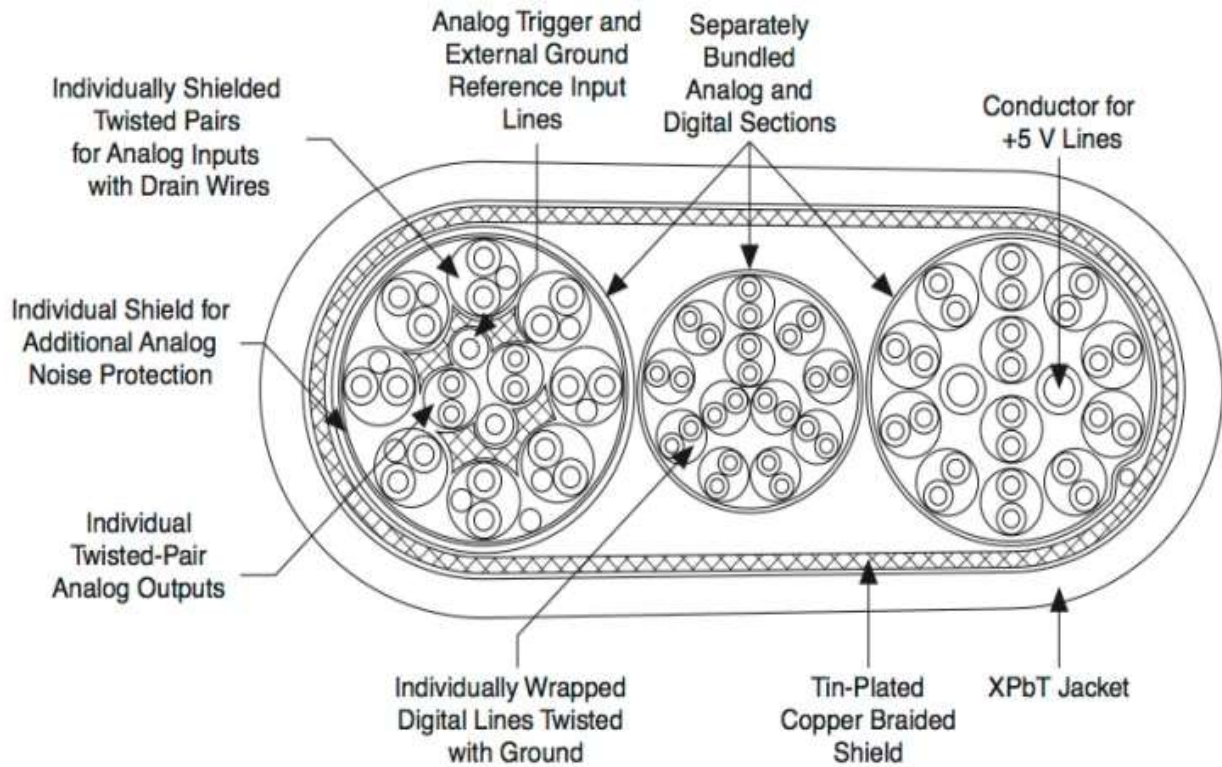


Figure 1: Example cross-section of cable with shielding and twisted pairs.

Shielding

Shielded cable assemblies are designed and manufactured to provide maximum performance and noise immunity. This thin layer of metallic shielding reduces electromagnetic interference from other signals on the cable, and also from external noise sources. To achieve this, the entire cable, and sometimes groupings of conductors, are enclosed in shielding

NI also sells unshielded ribbon cables for low-cost applications or for environments and applications where noise and crosstalk are not a concern.

Twisted Pairs

Some twisted pairs are optimized for differential analog input signals through the use of positive (+) and negative (-) signal pairs. Noise or interference will appear on both lines, and thus the common-mode signal can be canceled by the differential ADC. Other pairs may be twisted with a ground wire or drain wire. By adding twisted pairs electromagnetic interference, noise, and crosstalk can be reduced.

Shielding with Twisted Pairs

Many NI shielded cable assemblies also feature twisted pairs for improved noise performance. Different shielded cables are recommended for different devices and applications, based on signal pairings and groupings, to give the best performance.

Troubleshooting Noise or Unexpected Readings

Are you having trouble getting a good reading or is your system not working as expected? Experiencing noise, interference, unexpected or unwanted readings can originate from many parts of your system. Choosing the proper cable, and ensuring you follow best wiring practices, will help ensure the best reading.

- Choosing the correct DAQ cable for your application is very important. For any environment susceptible to external noise and interference, NI recommends the use of a shielded cable. Signal integrity from both external interference and internal to the cable can also be affected by the specific wiring pairings and groupings. While many NI cables share the same connectors and pin mappings, internally the cables may be laid out very differently. [NI has carefully chosen cable recommendations for each device or module based on expected signals to be carried on each line.](#)
- Ensure that your device or module, cable, and accessory do not have any bent pins and that the cable is fully seated and secured using the jackscrews or latches. Models featuring SCSI 0.050 D-Type connectors are most susceptible to bent pins, while VHDCI and D-Sub are designed for more frequent plugging and unplugging.
- Choosing the optimal measurement grounded, ungrounded, referenced, nonreferenced, floating or differential analog measurement type is critical to signal integrity. Further, ensuring grounding and bias resistors are properly applied to certain measurement types is critical, and failure to do so will result in erratic or saturated readings. [See our field wiring guide for more information.](#)

Calculating Bend Radius

When mounting in a rack or enclosure or otherwise routing your cable, it is important to know how much you can bend the cable without damaging it. National Instruments follows 2014 NEC Section 300.34 Conductor Bend Radius and 300.24 Bending Radius standards to define the bend radius for cables. Many DAQ Multifunction I/O cables are assembled as multi-conductor cables with individually shielded conductors. Per these standards, the bend radius is then defined as 12 times the cable diameter. Cable diameter is specified in the [dimensional drawings](#) for the cable, and is also listed on the [cable guide page for your cable](#). Use the major diameter specification for the calculation. For example, the SHC-68-68-EPM specifies a major diameter of 0.540". As such the resulting bend radius would be $12 \times (0.540") = \sim 6.5"$. Note that other NI cables may specify a different bend radius, due to their construction.

NI DAQ Cables Connectivity and Features

The following table lists the most popular NI DAQ cables, and provides links to their **Cable Guide** page, if available. Use this table as a starting point when selecting or picking cable options for your application. General compatibility with NI DAQ devices, modules, and cables are listed on each **Cable Guide** page, but a more extensive list can be found in the [Multifunction DAQ I/O Compatibility guide](#).

Use this table to quickly identify NI DAQ cables connectivity, and features.

Shielding	Features	Model	Device Connector	Accessory Connector	Cable Guide	Dimensional Drawing
Shielded	Noise reducing, high performance	SH100M-100M Flex²	SCSI	SCSI	-	Link
		SHC68-68-EPM	VHDCI	SCSI	Link	Link
		SHC68-68-EP	VHDCI	SCSI	-	-
		SH68-68-EPM	SCSI	SCSI	Link	Link
		SH68-68-EP	SCSI	SCSI	-	-
		SH68-68R1-EP	SCSI	SCSI	Link	Link
		SH37F-37M	D-Sub	D-Sub	-	Link
	Basic shielding	SHC68-68	VHDCI	SCSI	Link	Link
		SH68-68	SCSI	SCSI	Link	Link
		SH68-68-D1	SCSI	SCSI	Link	Link
	Basic shielding, special purpose	SH68-C68-S¹	SCSI	VHDCI	-	-
		SHC68-68-A2	VHDCI	SCSI	-	Link
	For high voltage	DB37M-DB37F-EP	D-Sub	D-Sub	-	Link

Unshielded	For custom breakouts with VHDCI connectors	SHC68-C68-EPM	VHDCI	VHDCI	Link	-
		SHC68-C68-S	VHDCI	VHDCI	Link	Link
	Custom connectivity, not terminated	SHC68-NT-S	VHDCI	-	-	-
		SH37F-P-4	SCSI	-	-	-
	Conversion, to 68-pin	SH100-68-68	SCSI	SCSI	-	Link
	Low cost, ribbon cable	RC68-68	VHDCI	SCSI	Link	-
		R68-68	SCSI	SCSI	Link	-
		R37F-37M	D-Sub	D-Sub	-	-
		Low cost, ribbon cable, conversion, to 50-pin	R68-50	SCSI	IDC	-
R100-50-50			SCSI	IDC	-	-

¹ When used with DAQ devices and modules, the VHDCI end is connected to the device or module and SCSI end is connected to the accessory.

² The SH100M-100M Flex cable was formerly named SH100-100-F.

Additional Resources

NI DAQ Cable and Accessory Resources

- [Learn about specifications, model differences and other common questions for DAQ accessories.](#)
- [Learn about the compatibility of NI DAQ devices and modules with NI DAQ cables and accessories.](#)
- [Find the parts needed to make a custom cable, breakout fixture, or replace connectors and screws with NI DAQ hardware.](#)
- [Browse and search NI manuals, guides, specifications, datasheets, getting started guides, and more.](#)
- [Browse dimensional drawings for NI DAQ cables and accessories.](#)
- [Shop for NI DAQ cables, terminal blocks, and connector blocks.](#)

Other NI Cable and Accessory Resources

- [Learn about specifications, model differences and other common questions for NI Digital Instrument cables.](#)
- [Learn about cable and accessory compatibility for other NI Digital Instruments.](#)
- [Find the parts needed to make a custom cable, breakout fixture, or replace connectors and screws with NI Digital Instrument hardware.](#)
- [Learn about cable and accessory compatibility for C Series \(cDAQ or cRIO\) Modules.](#)