USER GUIDE
NI SMB-2163

Single-Ended Digital I/O Accessory

The NI SMB-2163 is a breakout box for National Instruments single-ended digital waveform generator/analyzer modules. The NI SMB-2163 provides an easy way to connect to other devices for testing and debugging.

This guide explains how to set up and use the NI SMB-2163 single-ended digital I/O (DIO) accessory with NI single-ended digital waveform generator/analyzer modules.

Contents

Conventions

The following conventions are used in this manual:

<>   Angle brackets that contain numbers separated by an ellipsis represent a range of values associated with a bit or signal name—for example, DIO <0..3>.

»   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.

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	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 a product, refer to the *Specifications* section for information about 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.
italic	Italic text denotes variables, emphasis, a cross reference, 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 NI SMB-2163, you need the following items:

❑ SHC68-C68-D2 cable assembly

❑ NI digital waveform generator/analyzer, installed in a PXI or CompactPCI chassis

❑ 50 Ω cables with SMB connectors

❑ The documentation included with the digital waveform generator/analyzer and driver software

❑ (Optional) Rack Mount Kit for CA-1000 (part number 777665-01), available from National Instruments

Related Documentation

The NI digital waveform generator/analyzer ships with several documents designed to familiarize you with different aspects of the module. The documentation set includes the following pieces:

- *NI Digital Waveform Generator/Analyzer Getting Started Guide*—Read this printed document to set up the digital waveform generator/analyzer and configure it to complete your first acquisition or generation.

- *NI Digital Waveform Generator/Analyzer Help*—This online document provides more in-depth information about the hardware capabilities of the module, theory of operation, programming flow, and software reference.

- NI digital waveform generator/analyzer specifications—This printed document provides specifications for your module.

Parts Locator

Refer to Figure 1 to locate connectors on the NI SMB-2163.
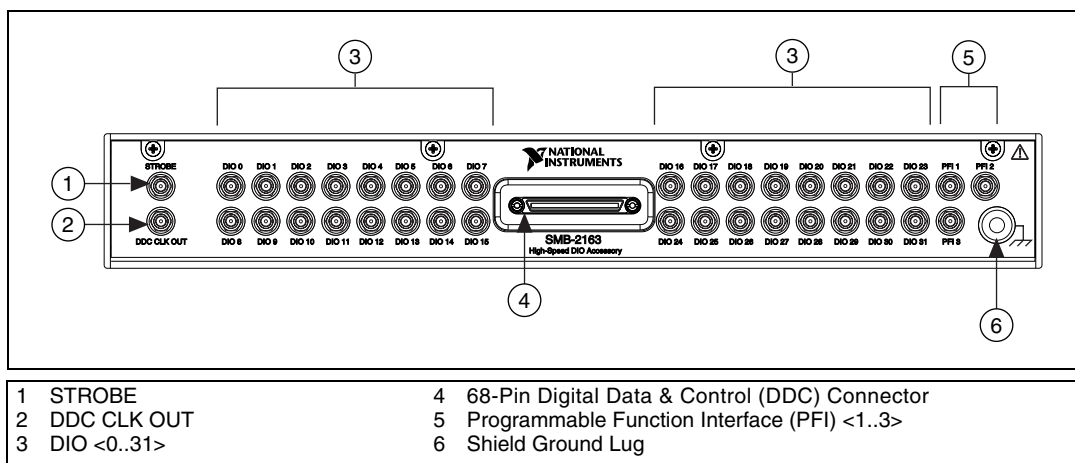

1	STROBE	4	68-Pin Digital Data & Control (DDC) Connector
2	DDC CLK OUT	5	Programmable Function Interface (PFI) <1..3>
3	DIO <0..31>	6	Shield Ground Lug

Figure 1. NI SMB-2163 Parts Locator Diagram

Installing Cables

Complete the following steps to install the NI SHC68-C68-D2 cable and any 50 Ω SMB cables.

⚠ **Caution** Disconnect power from the device, accessory, and any other connected hardware before connecting the cable to prevent damage to the hardware and personal injury. NI is *not* liable for damage resulting from improper connections.

1. Install the driver software and digital waveform generator/analyzer by following the installation procedure in the *NI Digital Waveform Generator/Analyzer Getting Started Guide*.

📝 **Note** Always install the module in a computer or PXI/CompactPCI chassis *before* attaching any cables or accessories.

2. Attach either end of an NI SHC68-C68-D2 cable assembly to the DDC connector of the digital waveform generator/analyzer and secure the cable with the captive screws on the cable connector.

📝 **Notes** Do *not* use cables other than the NI SHC68-C68-D2 cable with this accessory.

Do *not* use the NI SMB-2163 accessory with differential digital signals, such as the digital pattern output of the NI PXI-5421 signal generator.

The NI SMB-2163 is *not* compatible with the NI 653*X* products.

3. Attach and secure the other end of the NI SHC68-C68-D2 cable assembly to the DDC connector of the NI SMB-2163 and secure them together with the captive screws on the cable connector.

Figure 2 shows how the NI SHC68-C68-D2 cable connects the NI SMB-2163 and the digital waveform generator/analyzer.
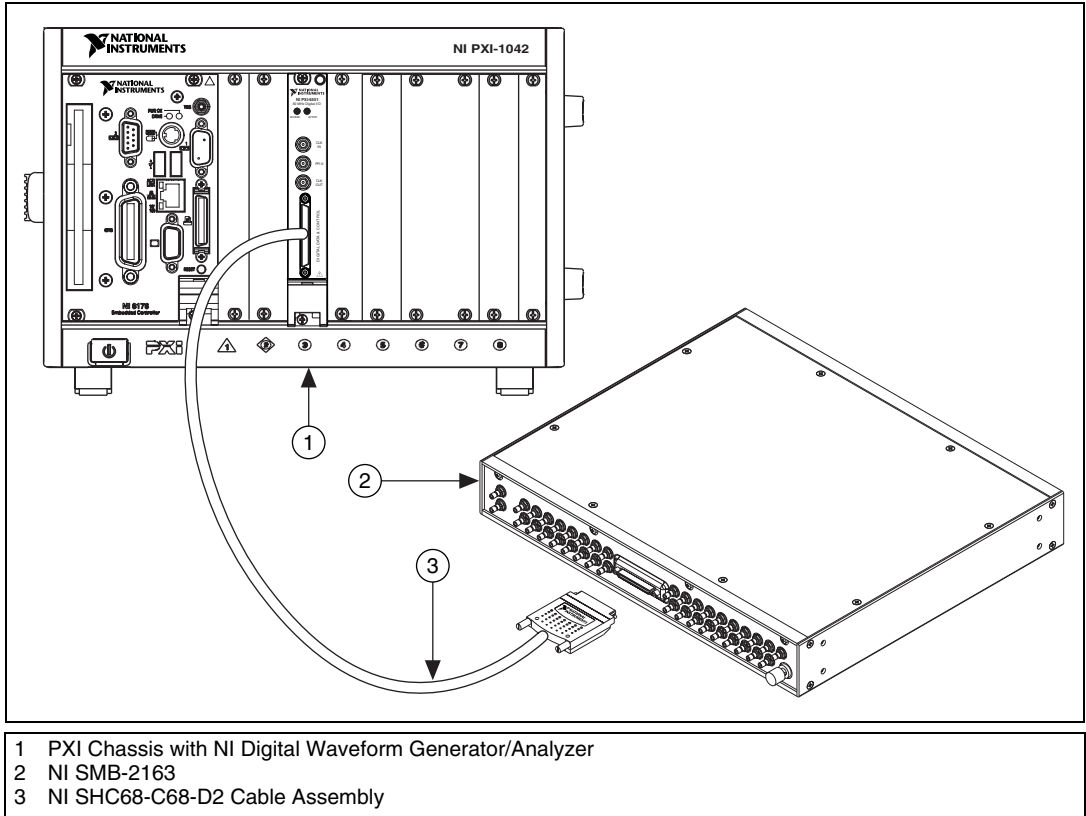

1   PXI Chassis with NI Digital Waveform Generator/Analyzer
2   NI SMB-2163
3   NI SHC68-C68-D2 Cable Assembly

Figure 2. Connecting a Single-Ended Digital Waveform Generator/Analyzer to the NI SMB-2163

4. Make signal connections by connecting SMB cables to NI SMB-2163 signal terminals.

Note   To ensure a solid ground connection, tighten the SMB connectors by gently snapping them into place.

Connecting Signals

The NI SMB-2163 provides connectivity to up to 32 single-ended DIO channels, three programmable function interface (PFI) channels, and two clock channels of an NI digital waveform generator/analyzer. You can connect to these signals from the labeled SMB connectors on the NI SMB-2163.

⚠ **Caution**   Connections that exceed any of the maximum ratings for the NI SMB-2163 or the NI digital waveform generator/analyzer can damage the device and the computer. Maximum input ratings are provided in the specifications document that shipped with the NI digital waveform generator/analyzer. NI is *not* liable for any damages resulting from such signal connections.

Figure 3 shows the pinout of the DDC connector of the accessory. Each DIO, PFI, and clock channel is connected to a corresponding pin on the NI SMB-2163.

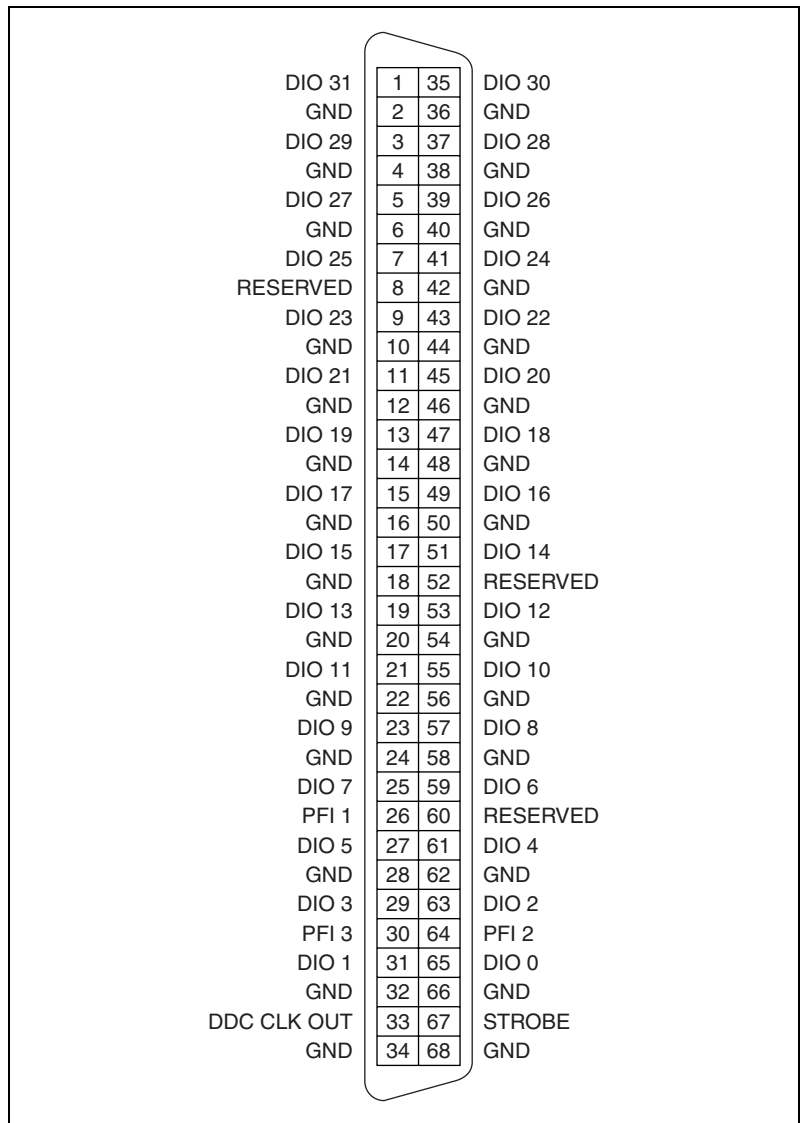Table 1 describes the DDC signals in the pinout.

DIO 31	1	35	DIO 30
GND	2	36	GND
DIO 29	3	37	DIO 28
GND	4	38	GND
DIO 27	5	39	DIO 26
GND	6	40	GND
DIO 25	7	41	DIO 24
RESERVED	8	42	GND
DIO 23	9	43	DIO 22
GND	10	44	GND
DIO 21	11	45	DIO 20
GND	12	46	GND
DIO 19	13	47	DIO 18
GND	14	48	GND
DIO 17	15	49	DIO 16
GND	16	50	GND
DIO 15	17	51	DIO 14
GND	18	52	RESERVED
DIO 13	19	53	DIO 12
GND	20	54	GND
DIO 11	21	55	DIO 10
GND	22	56	GND
DIO 9	23	57	DIO 8
GND	24	58	GND
DIO 7	25	59	DIO 6
PFI 1	26	60	RESERVED
DIO 5	27	61	DIO 4
GND	28	62	GND
DIO 3	29	63	DIO 2
PFI 3	30	64	PFI 2
DIO 1	31	65	DIO 0
GND	32	66	GND
DDC CLK OUT	33	67	STROBE
GND	34	68	GND

Figure 3. DDC Connector Pinout

✏️ **Note** Refer to the *NI Digital Waveform Generator/Analyzer Help* at **Program Files»National Instruments»NI-HSDIO»Documentation»NI Digital Waveform Generator/Analyzer Help** for information about the number of available DIO channels on your device. DIO <20..31> may not apply to your device.

Table 1. DDC Connector Pinout Descriptions

DDC Pin	Signal Description
DIO <0..31>	Bidirectional digital data channels 0 though 31.
STROBE	External Sample clock source for pattern acquisition.
DDC CLK OUT	Exported Sample clock signal.
PFI <1..3>	Programmable function interface channels 1 through 3.
GND	Ground reference for signals.
RESERVED	These channels are reserved for system use. Do not connect signals to these channels.

Note For additional shielding, you can connect the shield ground connector on the NI SMB-2163 to earth/hard ground. This terminal is connected to the shielded enclosure ground. The shield ground lug is shown in Figure 1.

Cleaning the Accessory

Disconnect all cables to the NI SMB-2163 before cleaning. To remove light dust, use a soft, nonmetallic brush. To remove other contaminants, use alcohol wipes. The unit must be completely dry and free from contaminants before returning to service.

Specifications

Digital I/O

DIO channels ....32, single-ended

Control I/O channels...............................5, single-ended

Typical propagation delay
through NI SMB-2163...........................1.2 ns

Typical channel-to-channel skew..........±35 ps

Typical trace
characteristic impedance.........................50 Ω

Power

Maximum voltage rating........................5.5 V

Physical

Dimensions..30.5 cm × 4.5 cm × 26.5 cm
(12.0 in. × 1.77 in. × 10.43 in.)

I/O connectors ....One 68-pin DDC connector,
37 SMB jack connectors,
one banana-style connector

CE Compliance

Refer to the regulatory statement for this product for additional
compliance information. To obtain this information for this product,
visit ni.com/hardref.nsf, search by model number or product line,
and click the appropriate link in the Certification column.

⚠ **Caution** When connected to other test objects, this product may cause radio interference.
In a residential environment, the user may be required to take adequate measures to reduce
the radio interference.

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.

Worldwide Support

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. You can access our branch office Web sites
from the Worldwide Offices section of ni.com. Branch office Web sites
provide up-to-date contact information, support phone numbers, email
addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 0 662 45 79 90 0,
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Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,
Germany 49 0 89 741 31 30, Greece 30 2 10 42 96 427,
India 91 80 51190000, Israel 972 0 3 6393737, Italy 39 02 413091,
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Slovenia 386 3 425 4200, South Africa 27 0 11 805 8197,
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