USER GUIDE
SMB-2163
Single-Ended Digital I/O Accessory

このドキュメントには、日本語ページも含まれています。

The SMB-2163 is a breakout box for National Instruments single-ended digital waveform generator/analyzer modules. The 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 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.
	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 SMB-2163, you need the following items:

* SHC68-C68-D4 (shielded) or C68-C68-D4 (unshielded) 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
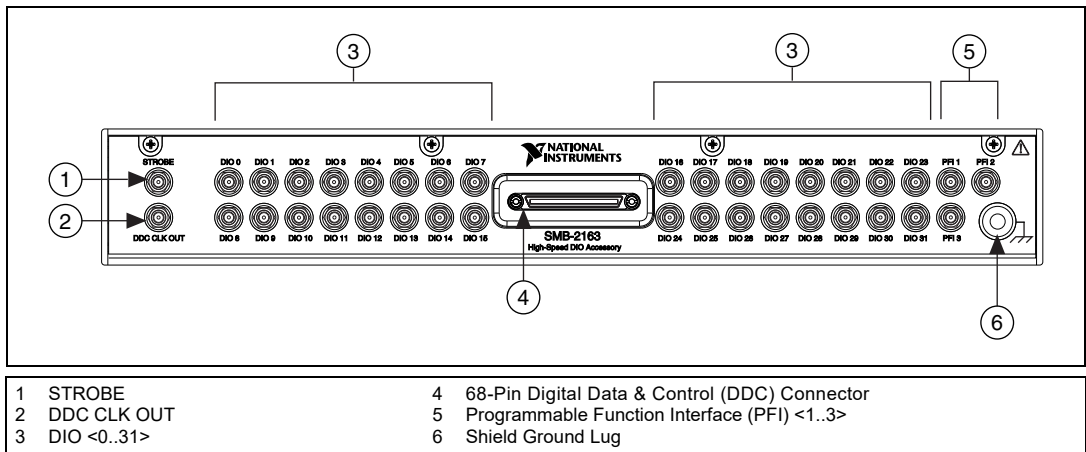
Refer to Figure 1 to locate connectors on the SMB-2163.

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. SMB-2163 Parts Locator Diagram

Installing Cables

Complete the following steps to install the SHC68-C68-D4/C68-C68-D4 cable and any 50 Ω SMB cables.

> **Notes** For applications with low noise or EMC compliance requirements, you must use the SC68-SC68-D4 (shielded) cable assembly.
>
> Do *not* use cables other than the SHC68-C68-D4 (shielded) or C68-C68-D4 (unshielded) cable with this accessory.

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 the 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 the SMB-2163 accessory with differential digital signals, such as the digital pattern output of the PXI-5421 signal generator.

The SMB-2163 is *not* compatible with the NI 6533/6534 products.

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

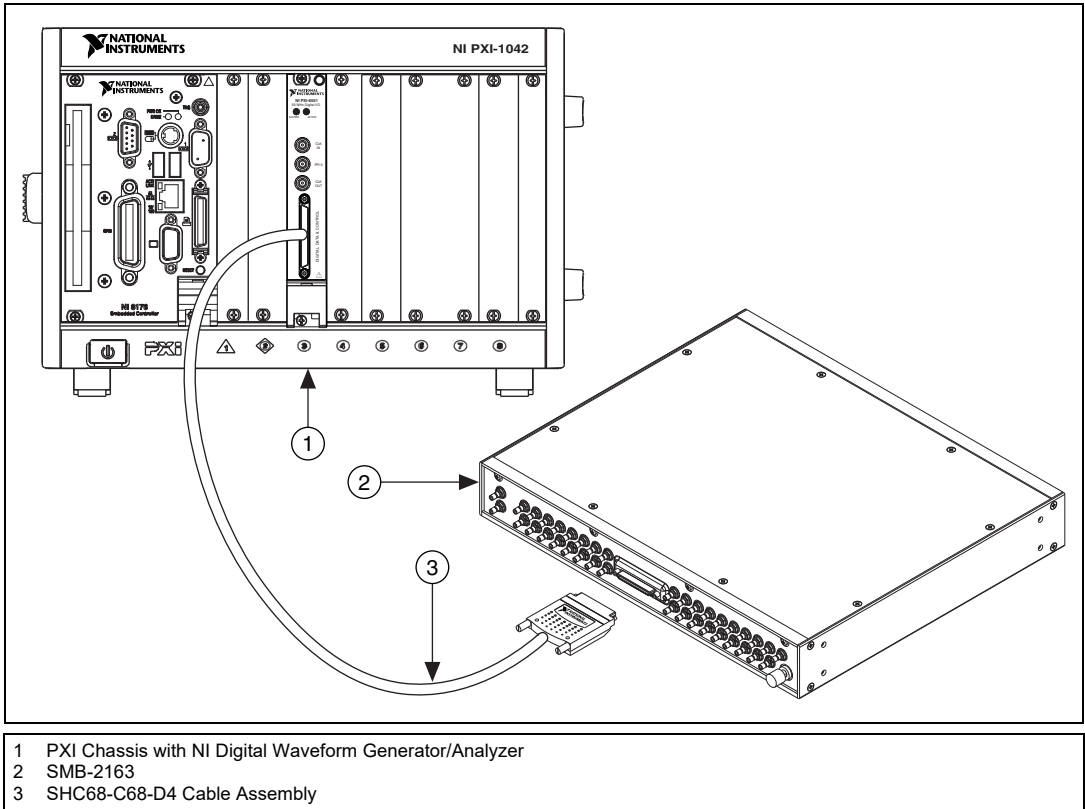Figure 2 shows how the cable assembly connects the SMB-2163 and the NI digital waveform generator/analyzer.

1	PXI Chassis with NI Digital Waveform Generator/Analyzer
2	SMB-2163
3	SHC68-C68-D4 Cable Assembly

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

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

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

Connecting Signals

The 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 SMB-2163.

⚠️ **Caution** Connections that exceed any of the maximum ratings for the 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 SMB-2163.

Table 1 describes the DDC signals in the pinout.

	Pin	Pin	
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 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 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 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.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

电子信息产品污染控制管理办法 （中国 **RoHS**）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

NI Services

Visit `ni.com/support` to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit `ni.com/services` to learn about NI service offerings such as calibration options, repair, and replacement.

Visit `ni.com/register` to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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