



NI-5753 National Instruments Digitizer Adapter Module User Guide

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NI-5753 National Instruments Digitizer Adapter Module



Product Information

- **Product Name:** NI 5753
- **Product Type:** FlexRIO Adapter Module
- **Description:** The NI 5753 is a FlexRIO adapter module designed to work in conjunction with FlexRIO FPGA modules and Controllers for FlexRIO. It is available in two variants, the -01 and the -02, each with different channel configurations and coupling options.

Variant	Channels	Accuracy	Sample Rates	Coupling	Output Voltage
NI 5753-01	Sixteen channels	16-bit accuracy	Up to 125 MS/s (default 120 M S/s)	AC-coupled	1.8 Vpp (+9.1 dBm)
NI 5753-02	Twelve channels	16-bit accuracy	Up to 125 MS/s (default 120 M S/s)	DC-coupled	0.9 Vpp (+3.2 dBm)

Product Usage Instructions

Installation and Configuration

Before you begin, complete the software and hardware installation instructions in the Getting Started guide for your FlexRIO FPGA module or Controller for FlexRIO.

To install and configure the NI 5753, follow these steps:

1. Refer to the Electromagnetic Compatibility Guidelines section in the product documentation to ensure proper usage in different environments.
2. Connect the NI 5753 adapter module to the appropriate FlexRIO FPGA module or Controller for FlexRIO.
3. Ensure that the connections are secure and properly seated.
4. Follow the clocking instructions provided in the Clocking section of the product documentation.

- 5. Refer to the Block Diagram section for an overview of the internal components and their connections.
- 6. If desired, refer to the Component-Level Intellectual Property (CLIP) sections for additional information on specific features and functionality.

Electromagnetic Compatibility Guidelines

This product complies with regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. To minimize interference and ensure proper performance, follow these guidelines:

- Use this product in industrial locations as intended.
- In residential or commercial areas, be aware that harmful interference may occur. Follow the instructions in the product documentation to prevent unacceptable performance degradation.
- Install and use this product strictly according to the instructions provided to minimize interference with radio and television reception.
- Do not make any modifications to the product that are not expressly approved by National Instruments, as it may void your authority to operate the product under local regulatory rules.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits are designed to provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment. This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation. Furthermore, any modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.

Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

Caution To ensure the specified EMC performance, the length of all I/O cables must be no longer than 3 m (10 ft).

FlexRIO Documentation

Table 1. FlexRIO Documentation Locations and Descriptions

Document	Location	Description
Getting started guide	Available from the Start	Contains installation instructions for
for your FlexRIO	menu and at ni.com/	your FlexRIO system.
FPGA module or	manuals.	
Controller for FlexRIO		
Specifications	Available from the Start	Contains specifications for your
document for your	menu and at ni.com/	FlexRIO FPGA module or Controller
FlexRIO FPGA module	manuals.	for FlexRIO.
or Controller for		
FlexRIO		

Document	Location	Description
Getting started guide for your adapter module	Available from the Start menu and at ni.com/ manuals .	Contains signal information, examples, and CLIP details for your adapter module.
Specifications document for your adapter module	Available from the Start menu and at ni.com/ manuals .	Contains specifications for your adapter module.
<i>LabVIEW FPGA Module Help</i>	Embedded in <i>LabVIEW Help</i> and at ni.com/ manuals .	Contains information about the basic functionality of the LabVIEW FPGA Module.
<i>Real-Time Module Help</i>	Embedded in <i>LabVIEW Help</i> and at ni.com/ manuals .	Contains information about real-time programming concepts, step-by-step instructions for using LabVIEW with the Real-Time Module, reference information about Real-Time Module VIs and functions, and information about LabVIEW features on real-time operating systems.
<i>FlexRIO Help</i>	Available from the Start menu and at ni.com/ manuals .	Contains information about the FPGA module front panel connectors and I/O, controller for FlexRIO front panel connectors and I/O, programming instructions, and adapter module component-level IP (CLIP).
LabVIEW Examples	Available in NI Example Finder. In LabVIEW, click Help»Find Examples» Hardware Input and Output»FlexRIO .	Contains examples of how to run FPGA VIs and Host VIs on your device.
IPNet	Located at ni.com/ipnet .	Contains LabVIEW FPGA functions and intellectual property to share.
FlexRIO product page	Located at ni.com/flexrio .	Contains product information and data sheets for FlexRIO devices.

FlexRIO Examples

FlexRIO includes several example applications for LabVIEW. These examples serve as interactive tools, programming models, and as building blocks in your own applications.

Accessing FlexRIO Examples

FlexRIO examples are available in LabVIEW's NI Example Finder. Complete the following steps to access the examples by task.

1. In LabVIEW, click Help»Find Examples.
2. In the NI Example Finder window that appears, click Hardware Input and Output»

FlexRIO.

The examples are sorted by task. Click on an example and refer to the Information window for a description of the example. Refer the Requirements window for a list of hardware devices that can run the example. You can also click the Search tab to search all installed examples by keyword. For example, search for FlexRIO to locate all FlexRIO examples. Examples also are available online that demonstrate FlexRIO basics, such as using DRAM, acquiring data from adapter modules, and performing high throughput streaming. Refer to ni.com/examples for these examples and for more information.

Verifying the System Requirements

To use the NI 5753, your system must meet certain requirements. For more information about minimum system requirements, recommended system, and supported application development environments (ADEs), refer to the readme, which is available on the software media or online at ni.com/updates.

Unpacking

Caution To prevent ESD from damaging the devices, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove each module from the package and inspect it for loose components or any other sign of damage.
 - **Caution** Never touch the exposed pins of connectors.
 - **Note** Do not install a device if it appears damaged in any way.
3. Unpack any other items and documentation from the kit. Store the devices in the antistatic package when they are not in use.

Preparing the Environment

Ensure that the environment you are using the NI 5753 it meets the following specifications. Operating temperature (IEC 60068-2-1, IEC 60068-2-2) 0 °C to 55 °C

- Operating humidity (IEC 60068-2-56) 10% to 90% RH, non-condensing
- Pollution Degree 2
- Maximum altitude 2,000 m at 25 °C ambient temperature Indoor use only.

Note Refer to the NI 5753 Specifications at ni.com/manuals for complete specifications.

Caution Clean the hardware with a soft, nonmetallic brush. Make sure that the hardware is completely dry and free from contaminants before returning it to service.

Installing the NI 5753

Refer to the getting started guide for your FlexRIO FPGA module or Controller for FlexRIO for instructions about how to install your FlexRIO system, including the NI 5753.

Confirming that Measurement & Automation Explorer (MAX) Recognizes the Device

Use Measurement & Automation Explorer (MAX) to configure your NI hardware. MAX informs other programs about which devices reside in the system and how they are configured. MAX is automatically installed with FlexRIO Support.

1. Launch MAX by navigating to Start»All Programs»National Instruments»NI MAX or by clicking the NI MAX desktop icon.
2. In the Configuration pane, double-click Devices and Interfaces to see the list of installed devices. Installed devices appear under the name of their associated chassis.
3. (PXI and PXI Express devices only) Expand your Chassis tree item. MAX lists all devices installed in the

chassis. Your default device names may vary.

- **Note** If you do not see your hardware listed, press <F5> to refresh the list of installed devices. If the device is still not listed, power off the system, ensure the device is correctly installed, and restart.

4. (Controllers for FlexRIO only) Your device appears under the Remote Devices section.

Connecting Cables to the NI 5753

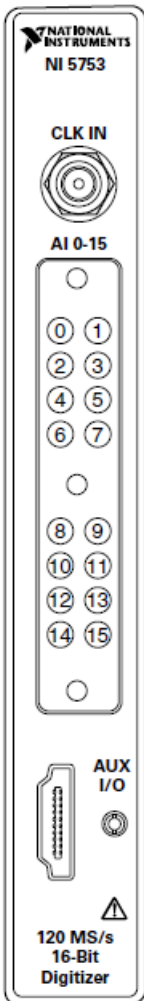
1. Use any shielded 50 Ω SMA cable to connect signals to the CLK IN connector on the front panel of your NI 5753.
2. Use the SHH19-H19-AUX cable (NI part number: 152629-01 or 152629-02) to connect to the digital I/O (DIO) and programmable function interface (PFI) signals on the AUX I/O connector. NI recommends using the SCB-19 connector block to access the DIO and PFI signals.
3. Use an MCX connector to connect signals to the analog input connector on the front panel. You can connect each channel with an individual cable, or you can use the ganged, 16-channel, male MCX to female SMA cable (part number 785244-01).

Accessories

The NI 5753 can be used with the SCB-19 shielded desktop connector block. Refer to the SCB-19 User Guide for information about how to connect and use the SCB-19 with the AUX I/O front panel connector on your NI 5753.

Front Panel and Connector Pinouts

The following figure shows the front panel connectors for the NI 5753.

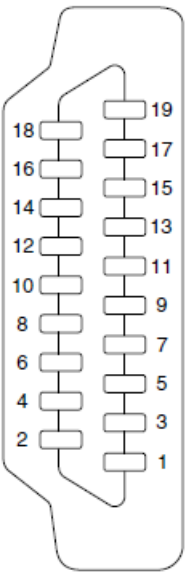
Device Front Panel	Connector	Signal Description
	CLK IN	Sample Clock input
	AI 0-15	Analog input channels. AI 0-15 are accessible on the NI 5753-01 variant only. The NI 5753-02 variant can access AI 0-11.
	AUX I/O	Digital I/O and PFI connector

Caution To avoid permanent damage to the NI 5753, disconnect all signals connected to the NI 5753 before powering down the module, and connect signals only after the adapter module has been powered on by the FlexRIO FPGA module or Controller for FlexRIO.

Caution Connections that exceed any of the maximum ratings of any connector on the NI 5753 can damage the device and the chassis. NI is not liable for any damage resulting from such connections.

AUX I/O Connector

Table 2. NI 5753 AUX I/O Connector Pin Assignments

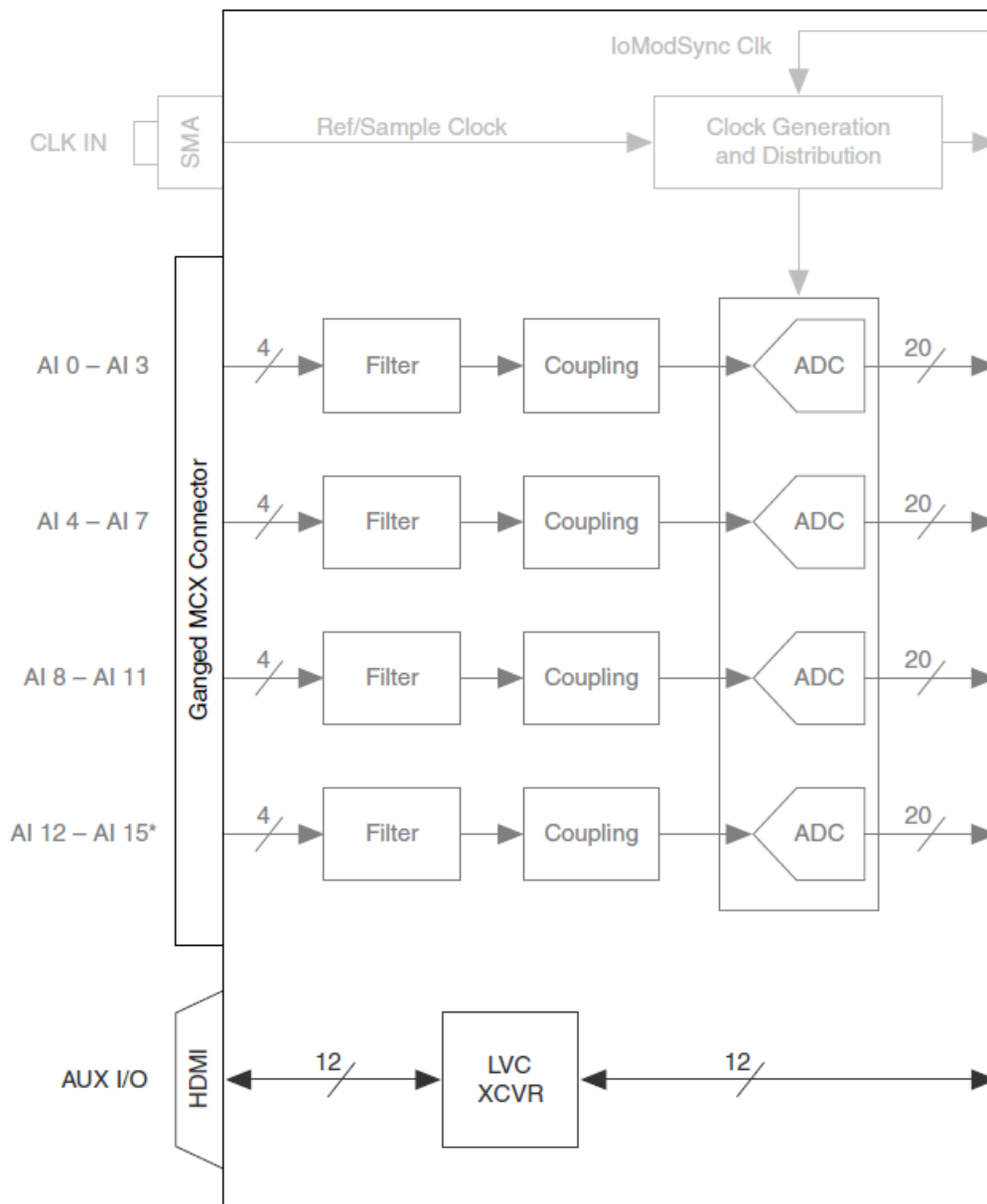
AUX I/O Connector	Pin	Signal	Signal Description
	1	DIO Port 0 (0)	Bidirectional single-ended (SE) digital I/O (DIO) data channel.
	2	GND	Ground reference for signals.
	3	DIO Port 0 (1)	Bidirectional SE DIO data channel.
	4	DIO Port 0 (2)	Bidirectional SE DIO data channel.
	5	GND	Ground reference for signals.
	6	DIO Port 0 (3)	Bidirectional SE DIO data channel.
	7	DIO Port 1 (0)	Bidirectional SE DIO data channel.
	8	GND	Ground reference for signals.
	9	DIO Port 1 (1)	Bidirectional SE DIO data channel.
	10	DIO Port 1 (2)	Bidirectional SE DIO data channel.
	11	GND	Ground reference for signals.
	12	DIO Port 1 (3)	Bidirectional SE DIO data channel.
	13	PFI 0	Bidirectional SE DIO data channel.
	14	NC	No connect.
	15	PFI 1	Bidirectional SE DIO data channel.
	16	PFI 2	Bidirectional SE DIO data channel.
	17	GND	Ground reference for signals.
	18	+5 V	+5 V power (10 mA maximum).
	19	PFI 3	Bidirectional SE DIO data channel.

Caution The AUX I/O connector accepts a standard, third-party HDMI cable, but the AUX I/O port is not an HDMI interface. Do not connect the AUX I/O port on the NI 5753 to the HDMI port of another device. NI is not liable for any damage resulting from such signal connections.

Block Diagram

The following figure shows the NI 5753 block diagram and signal flow.

Figure 1. NI 5753 Block Diagram



The AI 12 – AI 15 channels are unpopulated on the NI 5753-02 variant.

Component-Level Intellectual Property (CLIP)

The LabVIEW FPGA Module includes component-level intellectual property (CLIP) for HDL IP integration. FlexRIO devices support two types of CLIP: user-defined and socketed.

- User-defined CLIP allows you to insert HDL IP into an FPGA target, enabling VHDL code to communicate directly with an FPGA VI.
- Socketed CLIP provides the same IP integration of the user-defined CLIP, but it also allows the CLIP to communicate directly with circuitry external to the FPGA. Adapter module socketed CLIP allows your IP to communicate directly with both the FPGA VI and the external adapter module connector interface.

The FlexRIO adapter module ships with socketed CLIP items that add module I/O to the LabVIEW project.

NI 5753 AC-Coupled CLIP

The NI 5753 AC-coupled CLIP provides access to sixteen AC-coupled 16-bit 120 MS/s analog input channels, eight bidirectional DIO channels, and four bidirectional PFI channels. It also provides a User Command Interface to send raw SPI and I2C accesses to the adapter module for low-level configuration, and to select the clock modes:

- Internal Sample Clock (free-running)
- Internal Sample Clock locked to an external Reference Clock through the CLK/REF IN front panel connector
- Internal Sample Clock locked to an external Reference Clock through IoModSyncClock
- 70 MHz to 125 MHz external Sample Clock through the CLK/REF IN front panel connector
- 70 MHz to 125 MHz external Sample Clock through IoModSyncClock

In the LabVIEW FPGA Module, 16-bit analog input data is accessed using an I16 data type. The DIO signals are grouped into two ports of four signals each and are accessed using a U8 data type and a Boolean write enable signal. The four PFI signals are accessed individually using Boolean signals.

Related Information

Refer to the FlexRIO Help for more information about FlexRIO CLIP items, how to configure the NI 5753 with a socketed CLIP, and for a list of available socketed CLIP signals.

NI 5753 DC-Coupled CLIP

The NI 5753 DC-coupled CLIP provides access to twelve DC-coupled 16-bit 120 MS/s analog input channels, eight bidirectional DIO channels, and four bidirectional PFI channels. This module also contains a set of digital-to-analog converters (DACs) to trim larger DC offset errors induced by the coupling amplifier and system DC mismatch. This CLIP also provides a User Command Interface to send raw SPI and I2C accesses to the adapter module for low-level configuration, and to select the clock modes:

- Internal Sample Clock (free-running)
- Internal Sample Clock locked to an external Reference Clock through the CLK/REF IN front panel connector
- Internal Sample Clock locked to an external Reference Clock through IoModSyncClock
- 70 MHz to 125 MHz external Sample Clock through the CLK/REF IN front panel connector
- 70 MHz to 125 MHz external Sample Clock through IoModSyncClock

In the LabVIEW FPGA Module, 16-bit analog input data is accessed using an I16 data type. The DIO signals are grouped into two ports of four signals each and are accessed using a U8 data type and a Boolean write enable signal. The four PFI signals are accessed individually using Boolean signals.

Related Information

Refer to the FlexRIO Help for more information about FlexRIO CLIP items, how to configure the NI 5753 with a socketed CLIP, and a list of available socketed CLIP signals.

Clocking

The NI 5753 clock source controls the sample rate and other timing functions on the device. The following table contains information about the possible NI 5753 clock sources.

Clock Source	Frequency	Description
Internal Sample Clock	120 MHz	The internal Sample Clock is free- running.
Internal Sample Clock locked to an external Reference Clock through the CLK/REF IN front panel connector	10 MHz	The internal Sample Clock can be locked to an external Reference Clock through the CLK/REF IN front panel connector.
Internal Sample Clock locked to an external Reference Clock through IoModSyncClock	10 MHz	The internal Sample Clock can be locked to an external Reference Clock through the IoModSync Clock signal.

Clock Source	Frequency	Description
External Sample Clock through the CLK/REF IN front panel connector	70 MHz to 125 MHz	An external Sample Clock can be provided from the CLK/REF IN front panel connector.
External Sample Clock through loModSyncClock	70 MHz to 125 MHz	An external Sample Clock can be provided from the loModSyncClock signal via the DSTARA line.

Related Information

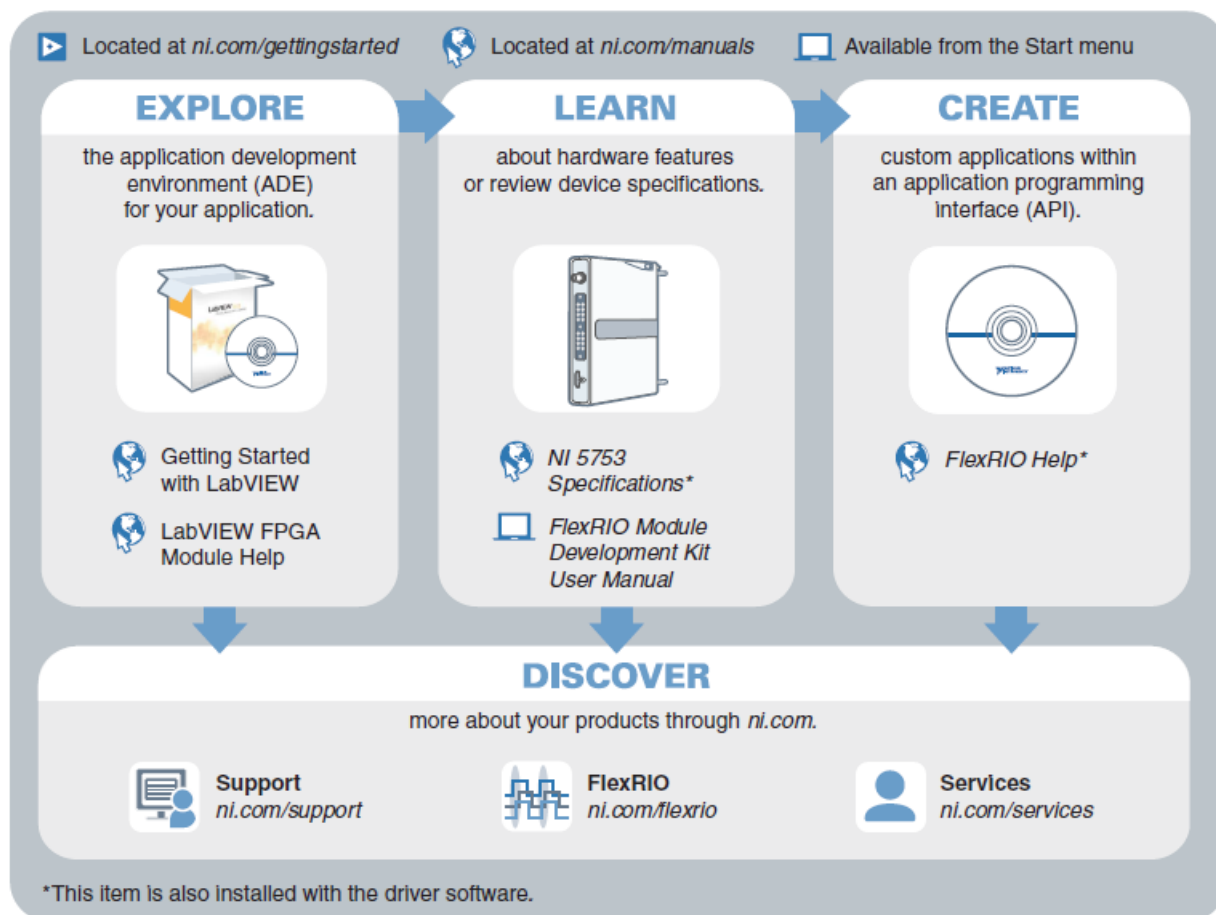
Refer to the FlexRIO Help for more information about the NI 5753 clocks.

Worldwide Support and Services

The NI website is your complete resource for technical support. At ni.com/support, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers. Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services. Visit ni.com/register to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI. A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration. NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/global to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Where to Go Next

Refer to the following figure for information about other product tasks and associated resources for those tasks.



GETTING STARTED GUIDE

NI 5753 120 MS/s Adapter Module Note Before you begin, complete the software and hardware installation instructions in the getting started guide for your FlexRIO FPGA module or Controller for FlexRIO. The NI 5753 is a FlexRIO adapter module designed to work in conjunction with FlexRIO FPGA modules and Controllers for FlexRIO. The NI 5753 is available in two variants, the -01 and the -02. The following table lists the key features of each variant.

NI 5753-01	NI 5753-02
Sixteen channels	Twelve channels
16-bit accuracy	16-bit accuracy
Sample rates up to 125 MS/s (default 120 MS/s)	Sample rates up to 125 MS/s (default 120 MS/s)
AC-coupled	DC-coupled
1.8 V _{pp} (+9.1 dBm)	0.9 V _{pp} (+3.2 dBm)


This document explains how to install and configure the NI 5753.

INSTRUCTION

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Documents / Resources

	<p>NATIONAL INSTRUMENTS NI-5753 National Instruments Digitizer Adapter Module [pdf] User Guide</p> <p>NI 5753-01, NI 5753-02, NI-5753, NI-5753 National Instruments Digitizer Adapter Module, National Instruments Digitizer Adapter Module, Instruments Digitizer Adapter Module, Digitizer Adapter Module, Adapter Module, Module</p>
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References

- [NI Engineer Ambitiously - NI](#)
- [NI Engineer Ambitiously - NI](#)
- [NI Calibration Services - NI](#)
- [NI Product Certifications - NI](#)
- [NI Example Programs - NI Community](#)
- [NI What Is FlexRIO? - NI](#)
- [NI NI Learning Center - NI](#)
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