GETTING STARTED GUIDE

NI 5752/5752B

50 MS/s Digitizer Adapter Module

📋 **Note** Before you begin, complete the software and hardware installation instructions in your FlexRIO FPGA getting started guide or controller for FlexRIO getting started guide.

⚠️ **Caution** Using the NI 5752/5752B in a manner not described in this document may impair the protection the NI 5752/5752B provides.

The NI 5752/5752B is a 32-channel, 12-bit, 50 MS/s digitizer adapter module designed to work in conjunction with FlexRIO FPGA modules and controllers for FlexRIO.

This document explains how to install and configure the NI 5752/5752B.

The *NI 5752B* variant is compatible with all FlexRIO FPGA modules and controllers for FlexRIO. The *NI 5752* variant is compatible with the NI PXI-795*x*R and NI PXIe-796*x*R FPGA modules only.

📋 **Note** *NI 5752R* refers to the combination of your NI 5752/5752B adapter module and either a FlexRIO FPGA module or a controller for FlexRIO. *NI 5752/5752B* refers to your adapter module only.

Contents

NATIONAL INSTRUMENTS™

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, you must install PXI EMC Filler Panels, National Instruments part number 778700-01, in all open chassis slots. You can order a kit of six single slot EMC Filler Panels directly from NI by visiting `ni.com`.

⚠ **Caution** To ensure the specified EMC performance, the length of all I/O cables must be no longer than 30 m (100 ft).

FlexRIO Documentation

Table 1. FlexRIO Documentation Locations and Descriptions

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

Table 1. FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
Specifications document for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your adapter module.
LabVIEW FPGA Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about the basic functionality of the LabVIEW FPGA Module.
Real-Time Module Help	Embedded in *LabVIEW Help* 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.
FlexRIO Help	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).
FlexRIO Adapter Module Development Kit User Manual	Available from the Start menu at **Start**»**All Programs**» **National Instruments**»**NI FlexRIO**»**NI FlexRIO Adapter Module Development Kit**»**Documentation**.	Contains information about how to create custom adapter modules for use with FlexRIO FPGA modules.
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.

Table 1. FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
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.

Verifying the System Requirements

To use the NI 5752/5752B, 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*.

Compatibility with FPGA Modules and Controllers for FlexRIO

The NI 5752B variant is compatible with all FlexRIO FPGA modules and controllers for FlexRIO; however, the NI 5752 variant is only compatible with NI PXI-795xR and NI PXIe-796xR modules. The following table lists each adapter module's compatibility with FlexRIO FPGA modules and controllers for FlexRIO.

Table 2. Adapter Module Compatibility

	NI PXI-795xR	**NI PXIe-796xR**	**NI PXIe-797xR**	**NI-793xR**
NI 5752	Yes	Yes	No	No
NI 5752B	Yes	Yes	Yes	Yes

Accessories

NI SMB-2147/2148 devices are shielded signal accessories for NI 5752/5752B adapter modules. NI SMB-2147/2148 accessories provide easy connections to other devices for testing and debugging. For more information about these accessories, refer to the *NI SMB-2145/2146/2147/2148 User Guide*. The following figure shows a typical setup of the NI 5752/5752B with the NI SMB-2147 and NI SMB-2148 signal accessories.

Figure 1. NI 5752/5752B with NI SMB-2147 and NI SMB-2148 Signal Accessories
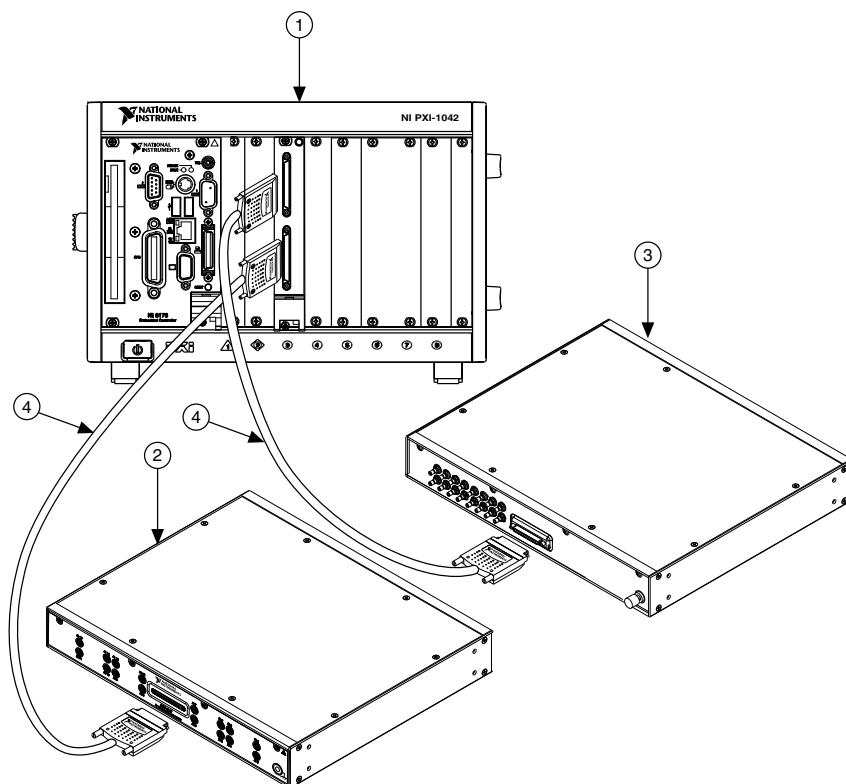
1.	PXI Chassis with FlexRIO FPGA and adapter module	3.	NI SMB-2148
2.	NI SMB-2147	4.	SHC68-C68-D4 Cable Assemblies

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 5752/5752B in 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, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m at 25 °C ambient temperature

Indoor use only.

Note Refer to the *NI 5752/5752B 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 5752/5752B

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 5752/5752B.

Cables

NI recommends using the following cables with the NI 5752/5752B.

Signal	Cable Description	Part Number
Analog	SHC68-C68-D3	188143B-01
Digital	SHC68-C68-D4	196275A-01

These cables connect directly to the analog and digital connector on the NI 5752/5752B.

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.

Front Panel and Connector Pinouts

The following figure shows the front panel connectors for the NI 5752/5752B.

Device Front Panel	Connector	Description
	AI 0-15	Analog input channels AI 0+/AI 0- through AI 15+/AI 15-
	AI 16-31	Analog input channels AI 16+/AI 16- through AI 31+/AI 31-
	CLK IN	External Sample Clock input
	DIO 0-15	Digital input and output terminals

⚠ **Caution**   To avoid permanent damage to the NI 5752/5752B, disconnect all signals connected to the NI 5752/5752B 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.
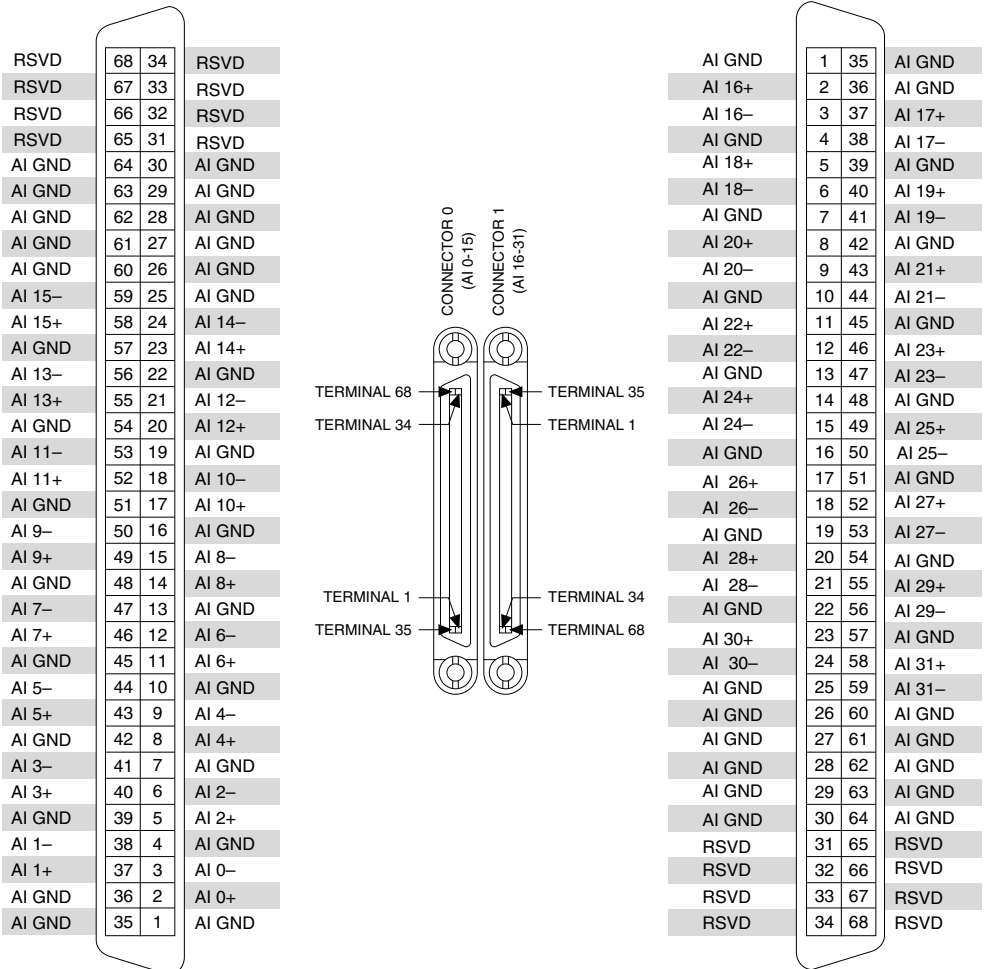
⚠ **Caution**   Connections that exceed any of the maximum ratings of any connector on the NI 5752/5752B can damage the device and the chassis. NI is not liable for any damage resulting from such connections.

Pinout and Signal Information

The following figure shows the pinout for the analog input VHDCI front panel connector.
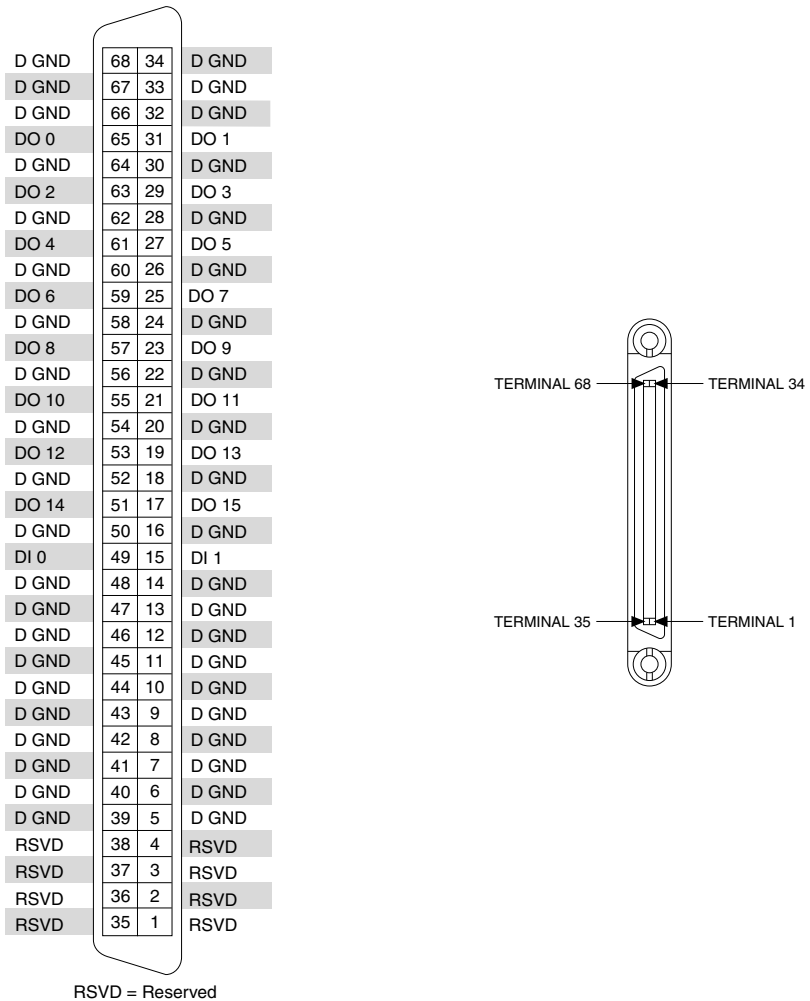
Figure 2. Analog Input CH 0–31 Pinout

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

CONNECTOR 0 (AI 0-15)

CONNECTOR 1 (AI 16-31)

TERMINAL 68
TERMINAL 34

TERMINAL 35
TERMINAL 1

TERMINAL 1
TERMINAL 35

TERMINAL 34
TERMINAL 68

RSVD = Reserved

The following figure shows the pinout for the digital input connector.

Figure 3. Digital Input Pinout

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

RSVD = Reserved

TERMINAL 68 — TERMINAL 34

TERMINAL 35 — TERMINAL 1

Block Diagram

The following figure shows the NI 5752/5752B block diagram and signal flow.

Figure 4. NI 5752 Block Diagram
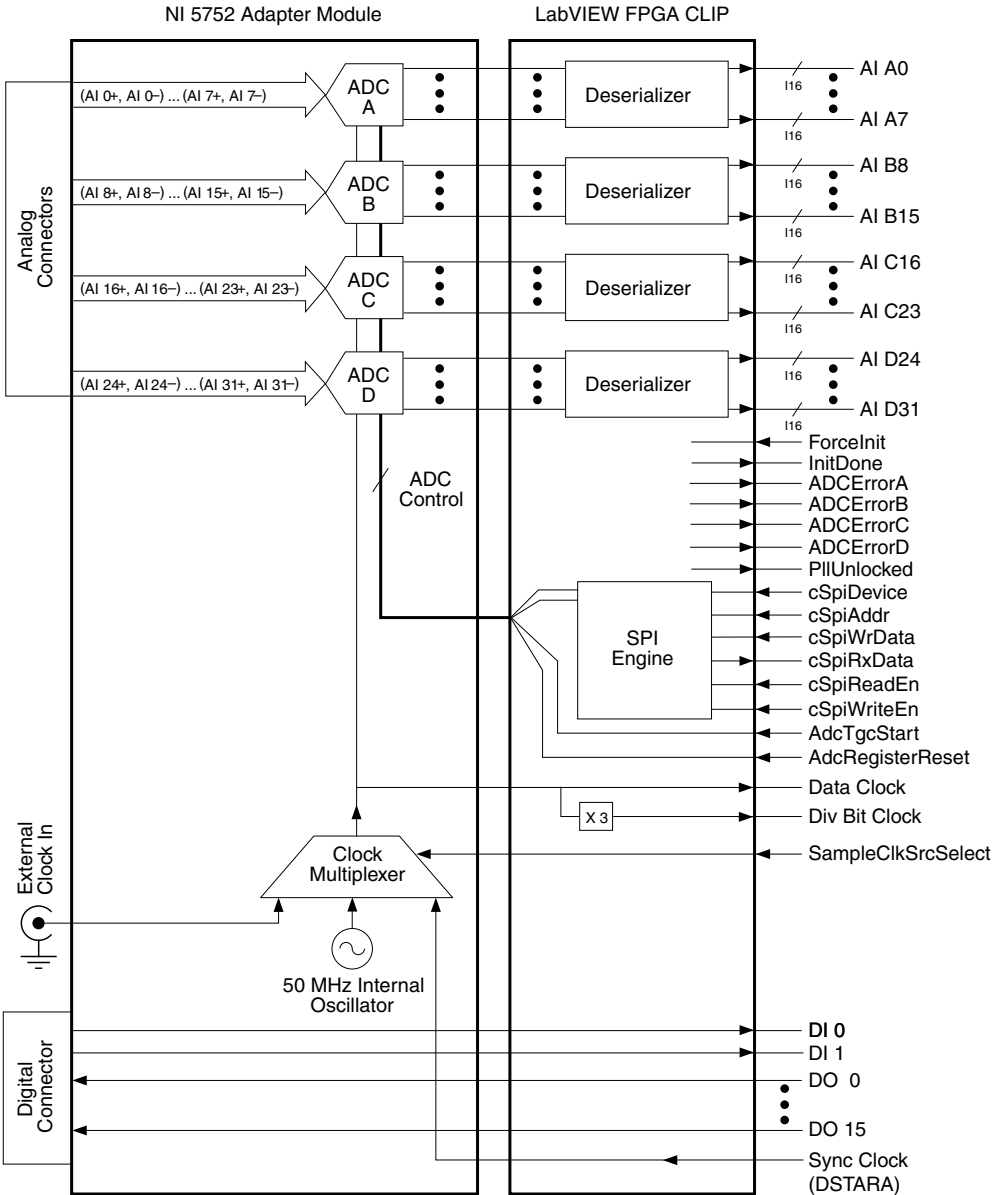
Component-Level Intellectual Property (CLIP)

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 5752/5752B CLIP

The NI 5752/5752B ships with the following CLIP items:

1. NI 5752 IO Module—This CLIP provides access to thirty-two analog input channels, sixteen digital output lines, and two digital input lines. This CLIP also contains a SPI interface to program the ADC registers. In the NI 5752/5752B IO Module CLIP, each Sample Clock cycle generates a sample from the analog input channels. The following clock sources are available and are selectable using the **SampleClkSrcSelect** control.

    - 50 MHz onboard oscillator
    - DStarA through IOModSyncClock
    - External clock through the front panel SMB connector

    Only external sample clock rates from 25 MHz to 50 MHz are supported with this CLIP. Each 12-bit sample is output to LabVIEW as an I16 data type. The 12-bit data is left-justified and padded with 4 zeros in the LSBs. The data is clocked out of the CLIP on Data Clock.

2. NI 5752 Multidevice Synchronization—This CLIP provides access to thirty-two analog input channels, sixteen digital output lines and two digital input lines. This CLIP also contains a SPI interface to program the ADC registers. For applications requiring synchronization across multiple NI 5752/5752B modules, this CLIP is recommended. For more details on multidevice synchronization, refer to KnowledgeBase `5AN9QBLY` at *ni.com/support*.

    In the NI 5752/5752B Multidevice Synchronization CLIP, each Sample Clock cycle generates a sample from the analog input channels. DStarA is the only Sample Clock that is routed. Only Sample Clock rates from 25 MHz to 50 MHz are supported with this CLIP. Each 12-bit sample is output to LabVIEW as an I16 data type. The 12-bit data is

left-justified and padded with 4 zeros in the LSBs. You must rout DStarA to the CLIP from LabVIEW FPGA. The data is clocked out of the CLIP on Data Clock.

Related Information

Refer to the FlexRIO Help for more information about FlexRIO CLIP items, how to configure the NI 5752/5752B with a socketed CLIP, and for a list of available socketed CLIP signals.

Clocking

The NI 5752/5752B clock source controls the sample rate and other timing functions on the device. The following table contains information about the possible NI 5752/5752B clock sources.

Table 3. Sample Clock Sources

Clock	Notes	Frequency Range
50 MHz onboard clock	—	25 MHz to 50 MHz
Sync Clock (DStarA)	Sync Clock (DStarA) is only available on NI PXI Express FlexRIO FPGA modules (such as the NI PXIe-796xR). DStarA is not available on NI-793xR controllers for FlexRIO or NI PXI FlexRIO FPGA modules (such as the NI PXI-795xR). On PXI Express modules, Sync Clock is driven by the DStarA from the PXI/PXIe backplane. If you change the frequency of Sync Clock (DStarA) or CLK IN (when used as the Sample Clock), you must assert Force Initialization.	
CLK IN (front panel SMB)	If you change the frequency of Sync Clock (DStarA) or CLK IN (when used as the Sample Clock), you must assert Force Initialization.	

Related Information

For more information about clock sources, refer to the FlexRIO Help.

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/niglobal* 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.

EXPLORE
the application development
environment (ADE)
for your application.

*Getting Started
with LabVIEW*

*LabVIEW FPGA
Module Help*

LEARN
about hardware features
or review device
specifications.

*NI 5752/5752B
Specifications**

*FlexRIO Module
Development Kit
User Manual*

CREATE
custom applications within
an application programming
interface (API).

FlexRIO Help*

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more about your products through *ni.com.*

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ni.com/support

FlexRIO
ni.com/flexrio

Services
ni.com/services

*This item is also installed with the driver software.