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NI-7932R

Controller for FlexRIO™

This document lists the specifications for the NI-7932R. Specifications are subject to change without notice. For the most recent device specifications, refer to *ni.com/manuals*. Refer to your adapter module documentation for the adapter module specifications.

Note Using the NI-7932R in a manner not described in this document might impair the protection the NI-7932R provides.

Note Typical values are representative of an average unit operating at room temperature. These specifications are typical at 25 °C unless otherwise noted.

Contents

FlexRIO Documentation

Table 1. FlexRIO Documentation Locations and Descriptions

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

Table 1. FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
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.
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.

Processor

Type	Xilinx Zynq-7020, XC7Z020 All Programmable SoC, CLG484
Architecture	ARM Cortex-A9
Speed	667 MHz
Cores	2
Real-time clock accuracy	5 ppm
Operating system	NI Linux Real-Time (32-bit)

Nonvolatile memory	512 MB[1], SLC NAND Flash
Volatile memory (DRAM)	512 MB, DDR3
Flash reboot endurance	100,000 cycles[2]

For information about the life span of the nonvolatile memory and about best practices for using nonvolatile memory, visit *ni.com/info* and enter the Info Code SSDBP.

CMOS Battery

Typical battery life with power applied to power connector	10 years
Typical battery life in storage up to 70 °C	10 years

Internal Reference Clock

General Characteristics

Clock distribution part number	AD9511[3]; clock distribution
Oscillator type	VCXO
Oscillator model	Epson Toyocom TCO–2121U2
Frequency	100 MHz[4]
Frequency pull range	± 100 ppm

Typical Specifications

Frequency stability	
Temperature	±30 ppm over the operating temperature range
Aging	±5 ppm per year

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[1] Formatted capacity of nonvolatile memory may be slightly less than this value.
[2] You can increase the flash reboot endurance value by performing field maintenance on the device. If you expect that your application may exceed the maximum cycle count listed in this document, contact NI support for information about how to increase the reboot endurance value.
[3] For additional information about the AD9511, refer to the Analog Devices data sheet at www.analog.com.
[4] Onboard PLL circuitry divides the 100 MHz onboard oscillator to 10 MHz for use by adapter modules.

Network/Ethernet Port

Number of ports	1
Network interface	10Base-T, 100Base-TX, and 1000Base-T Ethernet
Compatibility	IEEE 802.3
Communication rates	10 Mbps, 100 Mbps, 1000 Mbps auto-negotiated, half/full-duplex
Maximum cabling distance	100 m/segment

USB Ports

Number of ports	
USB device port	1 standard micro-B connector
USB host port	1 standard A connector
USB interface	USB 2.0, Hi-Speed
Maximum data rate	480 Mb/s per port
Maximum current (USB Host Port)	1 A

SD Card Slot

Form factor	MicroSD
SD card support	SD and SDHC standards
Non-volatile memory[5]	Up to 32 GB[6]

REF IN

Number of channels	1, single-ended
Connector type	SMA
Frequency	10 MHz
Input impedance	50 Ω
Input coupling	AC

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[5] For information about the life span of the nonvolatile memory and about best practices for using nonvolatile memory, visit *ni.com/info* and enter the Info Code `SSDBP`.

[6] 1 GB is equal to 1 billion bytes; formatted capacity might be less.

Input voltage range	0.75 $V_{pk\text{-}pk}$ to 5.2 $V_{pk\text{-}pk}$
Absolute maximum voltage	±8.0 VDC, 8.0 $V_{pk\text{-}pk}$ AC
Duty cycle	40% to 60%

TRIG General Characteristics

Number of channels	1, single-ended
Connector type	SMA
Coupling	DC
Impedance	
Input	10 kΩ
Output	50 Ω
Logic level	3.3V CMOS
Voltage	
V_{IH_MIN}	2 V
V_{IL_MAX}	0.8 V
V_{OH_MIN} (unloaded)	3.1 V
V_{OL_MAX} (unloaded)	0.2 V
Absolute maximum voltage	±20 VDC, +21 dBm (7.1 $V_{pk\text{-}pk}$)
Current	
I_{OH_MAX}	12 mA
I_{OL_MAX}	-12 mA

High Speed Serial Ports

Data rate	10.3125 Gbps, 6.25 Gbps, 3.125 Gbps
Connector type	SFP+
Number of TX channels	2
Number of RX channels	2

Supported high speed cable type[7]	Electrical/optical
Optical cable power	3.3 V ± 5%, 500 mA per port, characteristic

📝 **Note** For detailed FPGA and high speed serial port specifications, refer to Xilinx documentation.

Non-volatile Storage

For information about the life span of the nonvolatile memory and about best practices for using nonvolatile memory, visit *ni.com/info* and enter the Info Code SSDBP.

Non-volatile memory	
SD removable (user supplied)	Up to 32 GB[8]
System memory	512 MB

Reconfigurable FPGA

FPGA	Kintex-7 XC7K325T
LUTs	203,800
DSP48 Slices (25 × 18 multiplier)	840
Embedded Block RAM (kbits)	16,020
Default timebase	40 MHz
Timebase accuracy	±100 ppm, 250 ps peak-to-peak jitter
Data transfers	DMA, interrupts, programmed I/O
Number of DMA channels	16

For detailed FPGA specifications, refer to Xilinx documentation.

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[7] Use only copper cable cables less than or equal to 3 m. Using copper cables with lengths greater than 3 m invalidates these specifications. If you use cables with a length greater than 3 m, use optical cables.

[8] 1 GB is equal to 1 billion bytes; formatted capacity might be less.

FPGA Digital Input/Output

Number of general-purpose channels	136, configurable as 136 single-ended, 68 differential, or a combination of both[9]
Channels per bank	
Bank 0/Bank 1	48
Bank 2	40
Compatibility	Configured through the FPGA and based on the attached adapter module; 1.2 V, 1.5 V, 1.8 V, 2.5 V, and 3.3 V I/O standards (refer to *xilinx.com*).
Protection	Refer to *xilinx.com*.
Current	Refer to *xilinx.com*.
Maximum I/O data rates	
Single-ended	400 Mb/s
Differential	1 Gb/s for LVDS
Multi-region clock inputs	6
Single-region clock inputs	5
Connection resources	SMA connector (TRIGGER and REF CLK)

FPGA-Accessible DRAM

Memory size	2 GB
Theoretical maximum data rate	10.5 GB/s

Power Requirements

The NI-7932R requires a power supply connected to the power connector.

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[9] The 136 channels span across three FPGA banks.

⚠ **Caution** You must use either the recommended power supply, or another UL listed ITE power supply with the NI-7932R.

⚠ **Caution** Exceeding the power limits may cause unpredictable behavior by the NI-7932R.

Voltage input range	9 V to 30 V (measured at the NI-7932R power connector)
Maximum power consumption[10]	60 W
Typical standby power consumption	11.4 W
Recommended power supply	>75 W, 12 VDC
EMC ratings for power input as described in IEC 61000	Short lines, long lines, and DC distributed networks
Power input connector	
Power receptacle	Weidmuller OMNIMATE Signal, S2C-SMT 3.50/04/90LF 1.8AU BK BX, part number 1993840000
Power plug	Weidmuller OMNIMATE Signal, B2CF 3.50/04/180F AU BK BX, part number 1993830000

Physical

Dimensions (not including connectors)	23.4 cm × 13.1 cm × 4.4 cm (9.21 in. × 5.14 in. × 1.73 in.)
Weight	1,170 g (41.27 oz.)

Safety Voltages

Connect only voltages that are below these limits.

Positive terminal to negative terminal	30 VDC maximum, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as *MAINS* voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels,

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[10] The maximum power consumption specification is based on a fully populated system running a high-stress application at elevated ambient temperature, and with all controllers, adapter modules, and peripheral devices consuming the maximum allowed power.

special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

⚠️ **Caution** Do not connect the NI-7932R to signals or use for measurements within Measurement Categories II, III, or IV.

📝 **Note** Measurement Categories CAT I and CAT O (Other) are equivalent. The input circuits are not intended for direct connection to the MAINs building installations of Categories CAT II, CAT III, or CAT IV.

⚠️ **Caution** You can impair the protection provided by the NI-7932R if you use it in a manner not described in this document.

Maximum Working Voltage at the FlexRIO Adapter Module Connector

📝 **Note** Maximum working voltage refers to the signal voltage plus the common-mode voltage between the NI-7932R and the adapter module.

Channel-to-earth	0 V to 3.3 V, Measurement Category I
Channel-to-channel	0 V to 3.3 V, Measurement Category I

⚠️ **Caution** Do not use this device for connecting to signals in Measurement Categories II, III, or IV.

Environment

Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

Operating Environment

Ambient temperature range	0 °C to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)

Storage Environment

Ambient temperature range	-40 °C to 71 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)
Relative humidity range	5% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56.)

Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)
Random vibration	
Operating	5 Hz to 500 Hz, 0.3 g_{rms} (Tested in accordance with IEC 60068-2-64.)
Nonoperating	5 Hz to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC 60068-2-64. Test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Compliance and Certifications

Safety

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions

- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations, certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance $\mathsf{C} \mathsf{E}$

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit *ni.com/certification*, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* 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 the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

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`.）

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*.

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