NI-7935
Specifications

Contents

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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.
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

Document	Location	Description
		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.

NI-7935 Pinout

Use the pinout to connect to terminals on the NI-7935.

Figure 1. Connector Pinout

Bank 0 (Secondary Side) / Bank 1 (Primary Side):

PCB Secondary Side			PCB Primary Side
+3.3V	P1	P1	+3.3V
SDA	S74	S148	SCL
TB_Power_Good	S73	S147	TB_Present
+12V	P2	P2	+12V
Vcco	S72	S146	Vcco
Veeprom	S71	S145	RSVD
GND	G37	G37	GND
TDC_Assert_CLK_n	S70	S144	IOModSyncClk_n
TDC_Assert_CLK	S69	S143	IOModSyncClk
GND	G36	G36	GND
GPIO_24_n	S68	S142	GPIO_0_n
GPIO_24	S67	S141	GPIO_0
GND	G35	G35	GND
GPIO_25_n	S66	S140	GPIO_1_n
GPIO_25	S65	S139	GPIO_1
GND	G34	G34	GND
GPIO_CC_26_n	S64	S138	GPIO_CC_2_n
GPIO_CC_26	S63	S137	GPIO_CC_2
GND	G33	G33	GND
GPIO_27_n	S62	S136	GPIO_3_n
GPIO_27	S61	S135	GPIO_3
GND	G32	G32	GND
GPIO_28_n	S60	S134	GPIO_4_n
GPIO_28	S59	S133	GPIO_4
GND	G31	G31	GND
GPIO_29_n	S58	S132	GPIO_5_n
GPIO_29	S57	S131	GPIO_5
GND	G30	G30	GND
GPIO_30_n	S56	S130	GPIO_6_n
GPIO_30	S55	S129	GPIO_6
GND	G29	G29	GND
GPIO_31_n	S54	S128	GPIO_7_n
GPIO_31	S53	S127	GPIO_7
GND	G28	G28	GND
GPIO_32_n	S52	S126	GPIO_8_n
GPIO_32	S51	S125	GPIO_8
GND	G27	G27	GND
GPIO_33_n	S50	S124	GPIO_9_n
GPIO_33	S49	S123	GPIO_9
GND	G26	G26	GND
GPIO_34_n	S48	S122	GPIO_10_n
GPIO_34	S47	S121	GPIO_10
GND	G25	G25	GND
GPIO_35_n	S46	S120	GPIO_11_n
GPIO_35	S45	S119	GPIO_11
GND	G24	G24	GND
GPIO_36_n	S44	S118	GPIO_12_n
GPIO_36	S43	S117	GPIO_12
GND	G23	G23	GND
GPIO_37_n	S42	S116	GPIO_13_n
GPIO_37	S41	S115	GPIO_13
GND	G22	G22	GND

Bank 0 (Secondary Side) / Bank 1 (Primary Side):

PCB Secondary Side			PCB Primary Side
GND	G21	G21	GND
GPIO_CC_38_n	S40	S114	GPIO_CC_14_n
GPIO_CC_38	S39	S113	GPIO_CC_14
GND	G20	G20	GND
GPIO_39_n	S38	S112	GPIO_15_n
GPIO_39	S37	S111	GPIO_15
GND	G19	G19	GND
GPIO_40_n	S36	S110	GPIO_16_n
GPIO_40	S35	S109	GPIO_16
GND	G18	G18	GND
GPIO_41_n	S34	S108	GPIO_17_n
GPIO_41	S33	S107	GPIO_17
GND	G17	G17	GND
GPIO_42_n	S32	S106	GPIO_18_n
GPIO_42	S31	S105	GPIO_18
GND	G16	G16	GND
GPIO_43_n	S30	S104	GPIO_19_n
GPIO_43	S29	S103	GPIO_19
GND	G15	G15	GND
GPIO_44_n	S28	S102	GPIO_20_n
GPIO_44	S27	S101	GPIO_20
GND	G14	G14	GND
GPIO_45_n	S26	S100	GPIO_21_n
GPIO_45	S25	S99	GPIO_21
GND	G13	G13	GND
GPIO_46_n	S24	S98	GPIO_22_n
GPIO_46	S23	S97	GPIO_22
GND	G12	G12	GND
GPIO_47_n	S22	S96	GPIO_23_n
GPIO_47	S21	S95	GPIO_23
GND	G11	G11	GND

Bank 2 (Secondary Side) / Bank 2 (Primary Side):

PCB Secondary Side			PCB Primary Side
GPIO_48_n	S20	S94	GPIO_58_n
GPIO_48	S19	S93	GPIO_58
GND	G10	G10	GND
GPIO_49_n	S18	S92	GPIO_59_n
GPIO_49	S17	S91	GPIO_59
GND	G9	G9	GND
GPIO_CC_50_n	S16	S90	GPIO_CC_60_n
GPIO_CC_50	S15	S89	GPIO_CC_60
GND	G8	G8	GND
GPIO_51_n	S14	S88	GPIO_61_n
GPIO_51	S13	S87	GPIO_61
GND	G7	G7	GND
GPIO_52_n	S12	S86	GPIO_62_n
GPIO_52	S11	S85	GPIO_62
GND	G6	G6	GND
GPIO_53_n	S10	S84	GPIO_63_n
GPIO_53	S9	S83	GPIO_63
GND	G5	G5	GND
GPIO_54_n	S8	S82	GPIO_64_n
GPIO_54	S7	S81	GPIO_64
GND	G4	G4	GND
GPIO_55_n	S6	S80	GPIO_65_n
GPIO_55	S5	S79	GPIO_65
GND	G3	G3	GND
GPIO_56_n	S4	S78	GPIO_66_n
GPIO_56	S3	S77	GPIO_66
GND	G2	G2	GND
GPIO_57_n	S2	S76	GPIO_67_n
GPIO_57	S1	S75	GPIO_67
GND	G1	G1	GND

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

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.

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

Network/Ethernet Port

Number of ports	1
Network interface	10Base-T, 100Base-TX, and 1000Base-T Ethernet
Compatibility	IEEE 802.3

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.

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]

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.

REF IN

Number of channels	1, single-ended
Connector type	SMA
Frequency	10 MHz
Input impedance	50 Ω
Input coupling	AC
Input voltage range	0.75 V_{pk-pk} to 5.2 V_{pk-pk}
Absolute maximum voltage	±8.0 VDC, 8.0 V_{pk-pk} AC
Duty cycle	40% to 60%

TRIG General Characteristics

Number of channels	1, single-ended
Connector type	SMA
Coupling	DC

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

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-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]

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.

System memory	512 MB

Reconfigurable FPGA

FPGA	Kintex-7 XC7K410T
LUTs	254,200
DSP48 Slices (25 × 18 multiplier)	1,540
Embedded Block RAM (kbits)	28,620
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.

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)

9. The 136 channels span across three FPGA banks.

FPGA-Accessible DRAM

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

Power Requirements

The NI-7935 requires a power supply connected to the power connector.

> ⚠️ **Caution** You must use either the recommended power supply, or another UL listed ITE power supply with the NI-7935.

> ⚠️ **Caution** Exceeding the power limits may cause unpredictable behavior by the NI-7935.

Voltage input range	9 V to 30 V (measured at the NI-7935 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	Short lines, long lines, and DC distributed

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.

61000	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

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-7935 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-7935 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
Relative humidity range	10% to 90%, noncondensing

Storage Environment

Ambient temperature range	-40 °C to 71 °C
Relative humidity range	5% to 95%, noncondensing

Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse
Random vibration	
Operating	5 Hz to 500 Hz, 0.3 g RMS
Nonoperating	5 Hz to 500 Hz, 2.4 g RMS

Compliance and Certifications

Safety Compliance Standards

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 C22.2 No. 61010-1

> **Note** For safety certifications, refer to the product label or the Product Certifications and Declarations 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 Product Certifications and Declarations section.

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

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 ***Engineering a Healthy Planet*** 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.

EU and UK Customers

- ⊠ **Waste Electrical and Electronic Equipment (WEEE)**—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）

- ⊚⑤⊚⊕ **中国RoHS**— NI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NI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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