NI PXIe-7868R

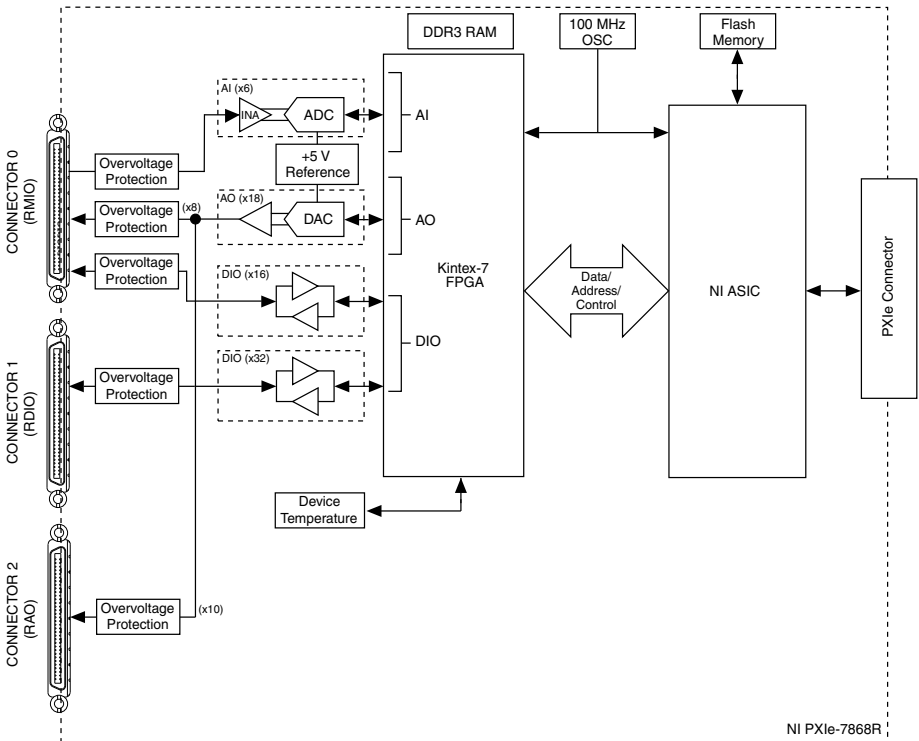R Series Reconfigurable I/O Module (AI, AO, DIO) for PXI Express,
6 AI, 18 AO, 48 DIO, 1 MS/s AIO, 512 MB DRAM,
Kintex-7 325T FPGA

This document provides compliance, pinout, connectivity, mounting, and power information for the NI PXIe-7868R.

Hardware Overview

The following high-level block diagram represents the NI PXIe-7868R.
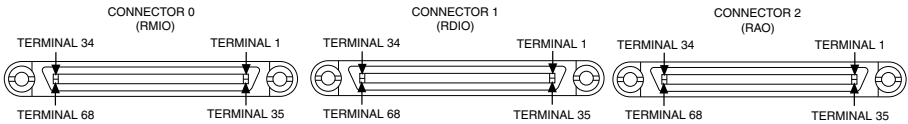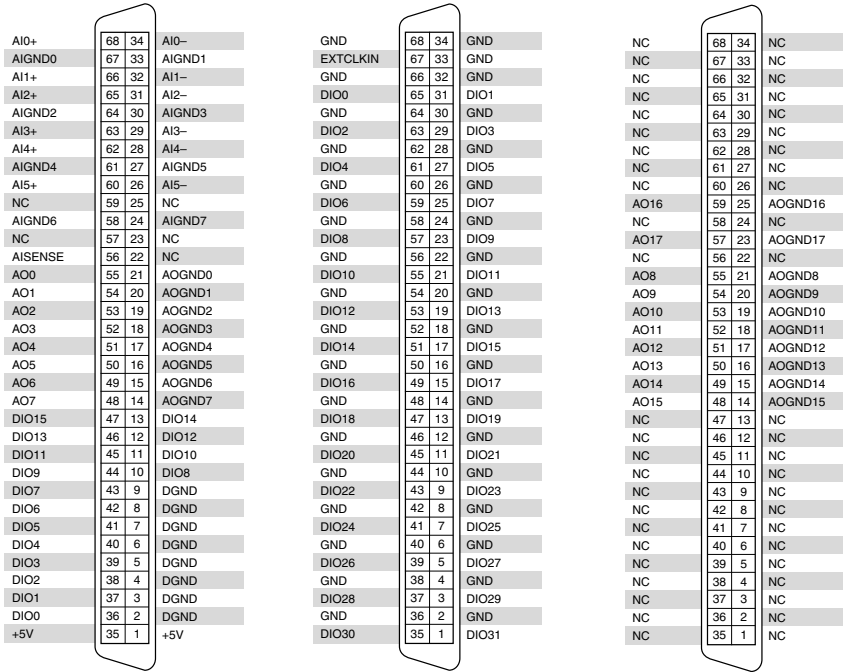
Figure 1. NI PXIe-7868R Block Diagram

NATIONAL INSTRUMENTS™

Pinout

Connector 0 (RMIO)

Signal	Pin	Pin	Signal
AI0+	68	34	AI0–
AIGND0	67	33	AIGND1
AI1+	66	32	AI1–
AI2+	65	31	AI2–
AIGND2	64	30	AIGND3
AI3+	63	29	AI3–
AI4+	62	28	AI4–
AIGND4	61	27	AIGND5
AI5+	60	26	AI5–
NC	59	25	NC
AIGND6	58	24	AIGND7
NC	57	23	NC
AISENSE	56	22	NC
AO0	55	21	AOGND0
AO1	54	20	AOGND1
AO2	53	19	AOGND2
AO3	52	18	AOGND3
AO4	51	17	AOGND4
AO5	50	16	AOGND5
AO6	49	15	AOGND6
AO7	48	14	AOGND7
DIO15	47	13	DIO14
DIO13	46	12	DIO12
DIO11	45	11	DIO10
DIO9	44	10	DIO8
DIO7	43	9	DGND
DIO6	42	8	DGND
DIO5	41	7	DGND
DIO4	40	6	DGND
DIO3	39	5	DGND
DIO2	38	4	DGND
DIO1	37	3	DGND
DIO0	36	2	DGND
+5V	35	1	+5V

Connector 1 (RDIO)

Signal	Pin	Pin	Signal
GND	68	34	GND
EXTCLKIN	67	33	GND
GND	66	32	GND
DIO0	65	31	DIO1
GND	64	30	GND
DIO2	63	29	DIO3
GND	62	28	GND
DIO4	61	27	DIO5
GND	60	26	GND
DIO6	59	25	DIO7
GND	58	24	GND
DIO8	57	23	DIO9
GND	56	22	GND
DIO10	55	21	DIO11
GND	54	20	GND
DIO12	53	19	DIO13
GND	52	18	GND
DIO14	51	17	DIO15
GND	50	16	GND
DIO16	49	15	DIO17
GND	48	14	GND
DIO18	47	13	DIO19
GND	46	12	GND
DIO20	45	11	DIO21
GND	44	10	GND
DIO22	43	9	DIO23
GND	42	8	GND
DIO24	41	7	DIO25
GND	40	6	GND
DIO26	39	5	DIO27
GND	38	4	GND
DIO28	37	3	DIO29
GND	36	2	GND
DIO30	35	1	DIO31

Connector 2 (RAO)

Signal	Pin	Pin	Signal
NC	68	34	NC
NC	67	33	NC
NC	66	32	NC
NC	65	31	NC
NC	64	30	NC
NC	63	29	NC
NC	62	28	NC
NC	61	27	NC
NC	60	26	NC
AO16	59	25	AOGND16
NC	58	24	NC
AO17	57	23	AOGND17
NC	56	22	NC
AO8	55	21	AOGND8
AO9	54	20	AOGND9
AO10	53	19	AOGND10
AO11	52	18	AOGND11
AO12	51	17	AOGND12
AO13	50	16	AOGND13
AO14	49	15	AOGND14
AO15	48	14	AOGND15
NC	47	13	NC
NC	46	12	NC
NC	45	11	NC
NC	44	10	NC
NC	43	9	NC
NC	42	8	NC
NC	41	7	NC
NC	40	6	NC
NC	39	5	NC
NC	38	4	NC
NC	37	3	NC
NC	36	2	NC
NC	35	1	NC

TERMINAL 34 — TERMINAL 1
TERMINAL 68 — TERMINAL 35

Table 1. NI PXIe-7868R Signal Descriptions

Signal	Description
AI+	Positive analog input signal connection
AI-	Negative analog input signal connection
AISENSE	Reference connection for NRSE measurements
AIGND	Ground reference for the analog input signal
AO	Analog output signal connection
AOGND	Ground reference for the analog output signal

Table 1. NI PXIe-7868R Signal Descriptions (Continued)

Signal	Description
DIO	Digital input/output signal connection
DGND	Ground reference for the digital signal
EXTCLKIN	External clock input source that can be used for source synchronous acquisitions. The provided clock source must be stable and glitch-free.
GND	Ground connection
Supply (+5 V$_{out}$)	5 V power output connection for external devices
NC	No connection

The NI PXIe-7868R is protected from overvoltage and overcurrent conditions.

Note Refer to the device specifications, available at *ni.com/manuals* for more information.

Connectivity Options

Use the following connection accessories and cables to access the signals on the I/O connectors.

Table 2. Connection Accessories and Cables

Connector Type	Accessory	Description	NI Part Number
RDIO	NI SCB-68 HSDIO	Shielded 68-Pin Connector Block for R Series DIO and HSDIO Products	782914-01
	NI SHC68-C68-RDIO2	Shielded R Series High Speed Digital Cable (1 m)	156166-01
		Shielded R Series High Speed Digital Cable (2 m)	156166-02
RMIO/RAO	NI SCB-68A	Noise Rejecting, Shielded I/O Connector Block	782536-01
	NI SHC68-68-RMIO	RMIO Shielded Cable, 68 pin D-Type to 68 pin VHDCI (1 m)	189588-01
		RMIO Shielded Cable, 68 pin D-Type to 68 pin VHDCI (2 m)	189588-02

Analog Input

The NI PXIe-7868R provides connections for six AI channels. Each channel has an AI+ pin, AI- pin, and AIGND pin to which you can connect both single-ended or differential voltage signals. Use the AISENSE pin to connect non-referenced single-ended signals.

Connecting Single-Ended Voltage Signals

To connect referenced single-ended voltage signals to the NI PXIe-7868R, you must connect the voltage ground signal to AI GND in order to keep the common-mode voltage in the specified range.

Figure 2. Connecting Referenced Single-Ended Signals to the NI PXIe-7868R
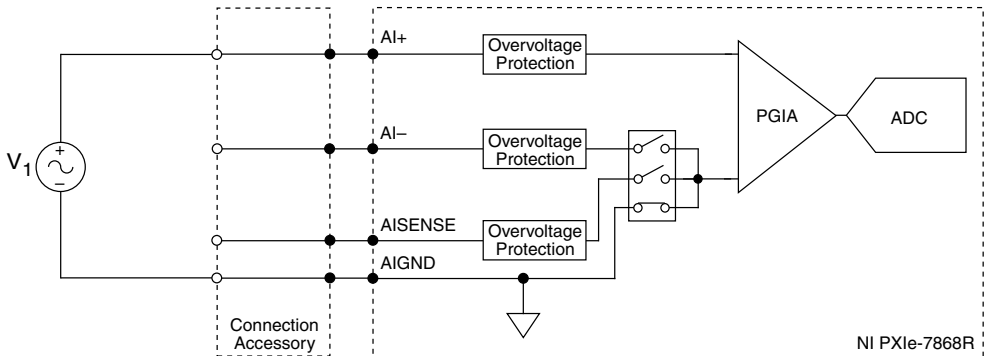
To connect non-referenced single-ended voltage signals to the NI PXIe-7868R, you must connect the voltage ground signal to AI SENSE in order to keep the common-mode voltage in the specified range.

Figure 3. Connecting Non-Referenced Single-Ended Signals to the NI PXIe-7868R
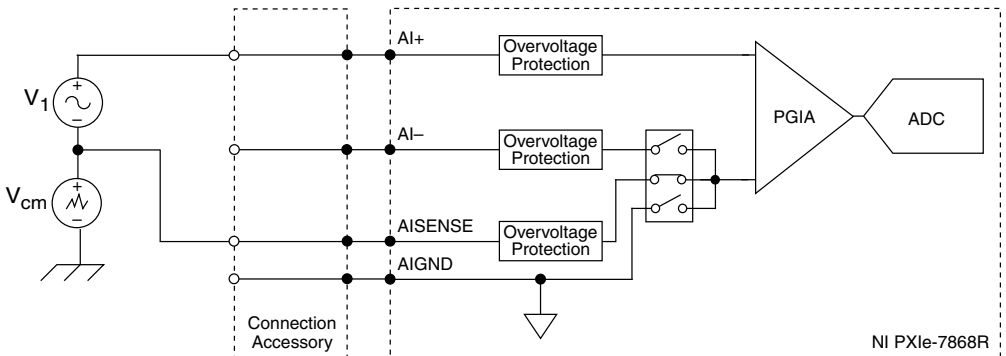
Connecting Differential Voltage Signals

You can connect grounded or floating differential signal sources to the NI PXIe-7868R. Connect the positive voltage signal to the AI+ and the negative voltage signal to AI-. To connect grounded differential signals to the NI PXIe-7868R, you must also connect the signal reference to AI GND.

Figure 4. Connecting Grounded Differential Signals to the NI PXIe-7868R
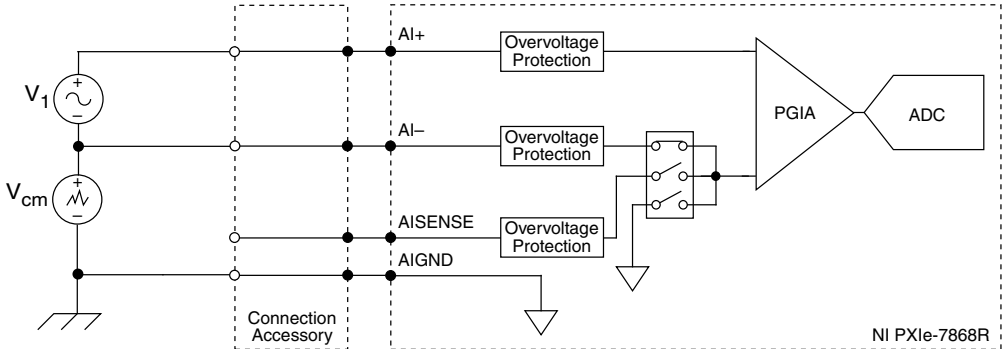
To connect floating differential signals to the NI PXIe-7868R, you must connect the negative and positive signals to AI GND through 1 MΩ resistors to keep the voltage within the common-mode voltage range. If the voltage source is outside the common-mode voltage range, the NI PXIe-7868R does not read data accurately.

Figure 5. Connecting Floating Differential Signals to the NI PXIe-7868R
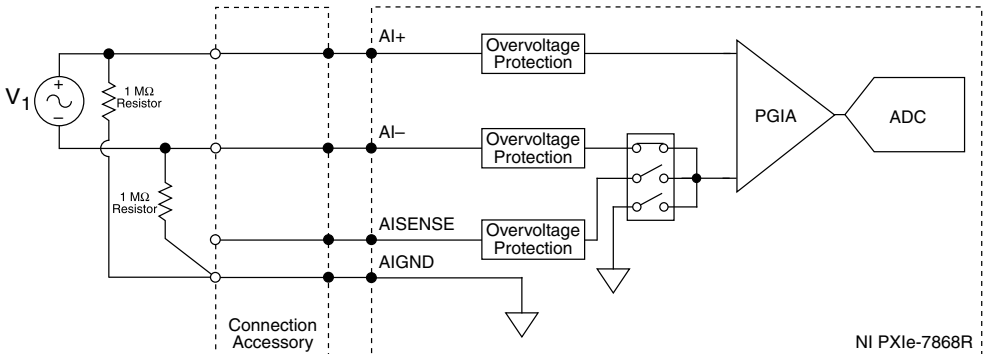
Analog Output

The NI PXIe-7868R provides connections for eighteen analog output channels. Each channel has an AO pin and AOGND pin to which you can connect a load.

Figure 6. Connecting a Load
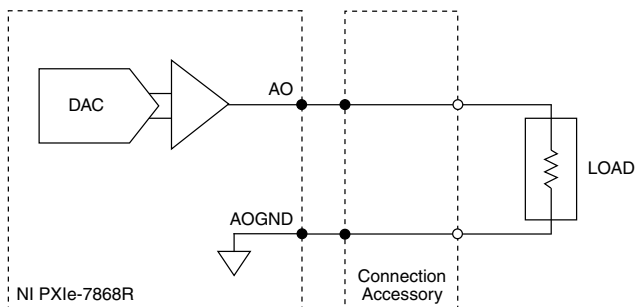
Digital I/O

The NI PXIe-7868R provides connections for 48 digital input/output (DIO) channels. Connector 0 contains 16 low-speed channels that can run up to 10 MHz signal frequencies and Connector 1 contains 32 high-speed DIO channels that can run up to 80 MHz signal frequencies. Each connector has a fixed logic level of 3.3 V. You can configure each channel as input or output.

Figure 7. Connecting to the DIO Channels
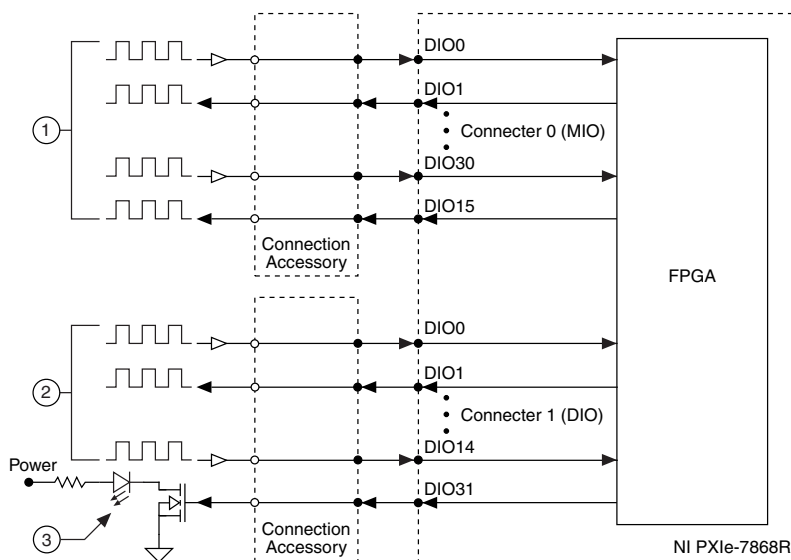
1. Low-speed signal frequencies up to 10 MHz with logic levels configured as 3.3 V.
2. High-speed signal frequencies up to 80 MHz with logic levels configured as 3.3 V.
3. LED

The DIO channels connect to the FPGA through buffers, which have overvoltage and undervoltage protection as well as over current protection. Refer to the device specifications on *ni.com/manuals* for more information about the maximum voltage and current.

When the system powers on, the DIO channels are set as input low with pull-down resistors. To set another power-on state, you can configure the NI PXIe-7868R to load a VI when the system powers on. The VI can then set the DIO lines to any power-on state. Visit *ni.com/info* and enter `RSeries_PowerUpStates` to learn more about configuring the power-up states for the NI PXIe-7868R.

All the high-speed DIO channels on Connector 1 are routed with a 50 Ω characteristic trace impedance. Route all external circuitry with a similar impedance to ensure best signal quality. NI recommends performing signal integrity measurements to test the affect of signal routing with the cable and connection accessory for your application.

Field Wiring Considerations

Environmental noise can seriously affect the measurement accuracy of the device if you do not take proper care when running signal wire between signal sources and the device. The following recommendations mainly apply to AI signal routing to the device, as well as signal routing in general.

Take the following precautions to minimize noise pickup and maximize measurement accuracy:

- Use differential AI connections to reject common-mode noise.
- Use individually shielded, twisted-pair wires to connect AI signals to the device. With this type of wire, the signal attached to the positive and negative inputs are twisted together and then covered with a shield. You then connect this shield only at one point to the signal source ground. This kind of connection is required for signals traveling through areas with large magnetic fields or high electromagnetic interference.
- Route signals to the device carefully. Keep cabling away from noise sources, such as video monitors and analog signals.

Use the following recommendations for all signal connections to the NI PXIe-7868R:

- Separate NI PXIe-7868R signal lines from high-current or high-voltage lines. These lines can induce currents in or voltages on the NI PXIe-7868R signal lines if they run in parallel paths at a close distance. To reduce the magnetic coupling between lines, separate them by a reasonable distance if they run in parallel or run the lines at right angles to each other.
- Do not run signal lines through conduits that also contain power lines.
- Protect signal lines from magnetic fields caused by electric motors, welding equipment, breakers, or transformers by running them through special metal conduits.

+5 V Power Source

Use the +5 V terminals on the I/O connector supply +5 V referenced to DGND to power external circuitry.

⚠️ **Caution** Never connect the +5 V power terminals to analog or digital ground or any other voltage source on the NI PXIe-7868R or any other device. Doing so can damage the device and the computer. National Instruments is not liable for damage resulting from such a connection.

The power rating is 4.75 to 5.1 V DC at 0.5 A.

Worldwide Support and Services

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