sbRIO-9607 Specifications

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This document lists the specifications for the NI sbRIO-9607. The following specifications are typical for the -40 °C to +85 °C operating temperature range unless otherwise noted.

> **Caution** Do not operate the sbRIO-9607 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to NI for repair.

Processor

Type	Xilinx Zynq-7000, XC7Z020 All Programmable SoC
Architecture	ARM Cortex-A9
Speed	667 MHz
Cores	2
Operating system	NI Linux Real-Time (32 bit)
Nonvolatile memory[1]	512 MB
Volatile memory (DRAM)	512 MB

1. Formatted nonvolatile memory may be slightly less than this value.

Real-time clock, accuracy	5 ppm
Flash reboot endurance[2]	100,000 cycles

Note 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.

Operating System

Note For minimum software support information, visit ni.com/info and enter the Info Code swsupport.

Supported operating system	NI Linux Real-Time (32-bit)
Minimum software requirements	
Application software	
LabVIEW	LabVIEW 2015, LabVIEW 2015 Real-Time Module, LabVIEW 2015 FPGA Module
Driver software	NI CompactRIO Device Drivers August 2015

To set up a C/C++ based toolchain, visit ni.com/info and enter the info code NILRTCrossCompile for more information.

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.

Reconfigurable FPGA

Type	Xilinx Zynq-7000, XC7Z020 All Programmable SoC
Number of logic cells	85,000
Number of flip-flops	106,400
Number of 6-input LUTs	53,200
Number of DSP slices (18 x 25 multipliers)	220
Available block RAM	560 KB
Number of DMA channels	16
Number of logical interrupts	32

Network/Ethernet Port

Number of interfaces	
Front Panel Ethernet	1 (Eth0)
RMC Ethernet	1 (Eth1)

Network interface	10Base-T, 100Base-TX, and 1000Base-T Ethernet[3]
Compatibility	IEEE 802.3
Communication rates	10 Mbps, 100 Mbps, 1000 Mbps auto-negotiated, half-/full-duplex
Maximum cabling distance	100 m/segment

RS-232 (DTE) Serial Port

Number of interfaces	
Onboard RS-232	1 (Serial1)
RMC RS-232 via FPGA 3.3 V DIO	4 (Serial2, Serial3, Serial4, Serial5)
Baud rate support	Arbitrary
Maximum baud rate	230,400 bps
Data bits	5, 6, 7, 8
Stop bits	1, 2

3. For revision C and earlier, 1000Base-T Ethernet link and communication is not guaranteed for primary or secondary Ethernet ports below -20 °C. If you expect ambient temperatures below -20 °C, NI recommends using a 10/100 network infrastructure or assigning 10/100Mbps communication speeds to the Ethernet Adapter in NI Measurement & Automation Explorer (MAX).

Parity	Odd, Even, Mark, Space
Flow control	RTS/CTS, XON/XOFF, DTR/DSR, None

RS-485 Serial Port

Number of interfaces	
RMC RS-485 via FPGA 3.3 V DIO	2 (Serial6, Serial7)
Maximum baud rate	460,800 bps
Data bits	5, 6, 7, 8
Stop bits	1, 1.5, 2
Parity	Odd, Even, Mark, Space
Flow control	XON/XOFF
Wire mode	4-wire, 2-wire, 2-wire auto
Isolation voltage, port to earth ground	None

Embedded CAN

Number of interfaces

Onboard CAN	1 (CAN0)
RMC CAN via FPGA 3.3 V DIO	1 (CAN1)
Onboard CAN transceiver	NXP PCA82C251T
Maximum baud rate	1 Mbps
Minimum baud rate	10 kbps

USB Port

Number of interfaces	
Front Panel USB Host	1 (USB0)
RMC USB Host/Device	1 (USB1)
Compatibility	USB 2.0, Hi-Speed
Maximum data rate	480 Mb/s
Maximum front panel USB current	900 mA

3.3 V Digital I/O on RMC Connector

Number of DIO channels	96
Maximum tested current per channel	±3 mA

Note The performance of the RMC DIO pins is bounded by the FPGA, signal integrity, the application timing requirements, and the RMC design. A general SPI application will typically be able to meet these requirements and achieve frequencies of up to 10 MHz. For more information on using DIO to connect to RMCs, visit ni.com/r/RMCDIO.

Input logic levels	
Input low voltage, V_{IL}	-0.3 V minimum; 0.8 V maximum
Input high voltage, V_{IH}	2.0 V minimum; 3.45 V maximum
Output logic levels	
Output high voltage, V_{OH} when sourcing 3 mA	2.4 V minimum; 3.45 V maximum
Output low voltage, V_{OL} when sinking 3 mA	0.0 V minimum; 0.4 V maximum

CMOS Battery

Note The battery is user-replaceable. The NI sbRIO device ships with a BR1225 coin cell battery from RAYOVAC, which is industrial-rated. Ensure that power remains connected to the NI sbRIO device while you replace the

battery so that time-keeping is not disrupted. Refer to the Battery Replacement and Disposal section for information about replacing the battery.

Typical battery life with power applied to power connector	10 years
Typical battery life in storage at 55 °C	2.5 years [4]

Power Outputs on RMC

Caution Exceeding the power limits may cause unpredictable device behavior.

+5 V power output	
Output voltage	5 V ±5%
Maximum current	1.5 A
Maximum ripple and noise	50 mV
+3.3 V_AUX power output	
Output voltage	3.3 V ±5%
Maximum current	0.33 A
Maximum ripple and noise	50 mV

4. Battery life may drop dramatically in extreme temperatures.

FPGA_VIO power output	
Output voltage	3.3 V ±5%
Maximum current	0.33 A
Maximum ripple and noise	50 mV

Power Requirements

The NI sbRIO device requires a power supply connected either to the power connector or through the VIN_filtered pins through the RMC. Refer to the ***Powering On the NI sbRIO Device*** section in the ***NI sbRIO-9607 Getting Started Guide*** on ni.com/manuals for information about connecting the power supply. Refer to the ***NI sbRIO-9607/9627 RMC Design Guide*** on ni.com/manuals for more information about how to power the NI sbRIO device through the RMC.

Caution Exceeding the power limits may cause unpredictable device behavior.

Recommended power supply	55 W, 30 VDC maximum
Power supply voltage range	9 VDC to 30 VDC
Reversed-voltage protection	30 VDC
Power consumption with RMC	28 W maximum

Environmental

Caution Clean the sbRIO-9607 with a soft, nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

Local ambient operating temperature near device (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C [5]
Maximum reported onboard sensor temperature	
CPU/FPGA temperature	98 °C
Primary System temperature	85 °C
Secondary System temperature	85 °C

Table 1. Component Maximum Case Temperature

Component	Manufacturer	Maximum Case Temperature
CPU/FPGA	Xilinx	NA[6]
DDR memory	Micron	95 °C
NAND flash	Micron	89 °C
CPLD	Lattice	94 °C
USB PHY	Microchip	120 °C
ENET PHY	Micrel	120 °C

The sbRIO-9607 includes three onboard temperature monitoring sensors to simplify validation of a thermal solution by indicating thermal performance during validation

5. If you expect ambient temperatures below -20 °C, NI recommends using a 10/100 network infrastructure or assigning 10/100Mbps communication speeds to the Ethernet Adapter in NI MAX. Refer to the Network/Ethernet Port section of this document for more information.
6. Use digital approach to ensure the on-chip temperature reading is below 98°C.

and deployment. The sensors measure the CPU/FPGA junction temperature and printed circuit board temperatures that can be used to approximate the primary and secondary side local ambient temperatures. This approach is called digital validation. Alternatively, the traditional analog approach using thermocouples can be used to validate thermal performance. The digital approach is more accurate for determining the performance of the CPU/FPGA but is more conservative for determining the local ambient temperatures. NI recommends using digital validation.

For digital validation, ensure that the reported CPU/FPGA, reported Primary System, and reported Secondary System temperatures do not exceed any of the maximum temperatures listed in this document. Thermal validation is complete if the reported temperatures are within specifications. For more information about how to access the onboard sensors, visit ni.com/info and enter the Info Code `sbriosensors`. If the reported Primary System temperature or reported Secondary System temperature exceed the maximum temperatures listed in this document then analog validation may be used for further verification.

For analog validation, measure the local ambient temperature by placing thermocouples on both sides of the PCB, 5 mm (0.2 in.) from the board surface. Avoid placing thermocouples next to hot components such as the CPU/FPGA or near board edges, which can cause inaccurate temperature measurements. In addition to the local ambient temperature, the case temperature of the components should not exceed the recommended maximum case temperature.

Note Some systems may require a heat sink or air flow to remain within the maximum allowed temperature ranges. You can mount the Thermal Kit for NI sbRIO-9607/9627/9637 (153901-02) heat spreader on the NI sbRIO device.

Note The NI sbRIO device thermal performance is greatly influenced by several factors, including resource utilization, mounting, and adjacent power dissipation. These factors can substantially affect the achievable external ambient temperature at which the maximum local and reported temperatures are reached. NI recommends additional thermal design to remain within the maximum allowed temperature ranges. For information about and examples of environmental and design factors that can affect the thermal performance of NI sbRIO systems, visit ni.com/info and enter the Info

> Code `sbriocooling`. For device-specific guidelines about enabling proper thermal design, refer to the ***NI sbRIO-9607 User Manual*** on ni.com/manuals.

Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-78)	5% RH to 95% RH, noncondensing
Maximum altitude	5,000 m
Pollution Degree (IEC 60664)	2

The NI sbRIO device is intended for indoor use only.

Physical Characteristics

Weight	87 g (3.069 oz)

Safety Voltages

Connect only voltages that are below these limits.

V terminal to C terminal	30 VDC maximum, Measurement Category I

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.

Battery Replacement and Disposal

- **Battery Directive**—This product contains a long-life coin cell battery. If you need to replace it, use the Return Material Authorization (RMA) process or contact an authorized NI service representative. For more information about compliance with the EU Battery Directive 2006/66/EC about Batteries and Accumulators and Waste Batteries and Accumulators, visit ni.com/environment/batterydirective.

电子信息产品污染控制管理办法（中国RoHS）

- **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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