

---

# **cRIO-9056**

# **Specifications**

---

2025-03-11



# Contents

cRIO-9056 Specifications..... 3

# cRIO-9056 Specifications

## Definitions

**Warranted** specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

**Characteristics** describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Typical** unless otherwise noted.

## Conditions

Specifications are valid for -20 °C to 55 °C unless otherwise noted.

## Processor

|                 |                  |
|-----------------|------------------|
| CPU             | Intel Atom E3805 |
| Number of cores | 2                |
| CPU frequency   | 1.33 GHz         |
| On-die L2 cache | 1 MB (shared)    |

## Software



**Note** For minimum software support information, visit [ni.com/r/SWsupport](https://ni.com/r/SWsupport).

|                                             |                                                                                                     |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Supported operating system                  | NI Linux Real-Time (64-bit)                                                                         |
| Supported C Series module programming modes | Real-Time (NI-DAQmx) mode<br>Real-Time Scan (I/O Variables)<br>LabVIEW FPGA                         |
| <b>Application software</b>                 |                                                                                                     |
| LabVIEW                                     | LabVIEW 2018 or later, LabVIEW Real-Time Module 2018 or later,<br>LabVIEW FPGA Module 2018 or later |



**Note** LabVIEW FPGA Module is not required when using Real-Time Scan (I/O Variables) mode or Real-Time (NI-DAQmx) mode. To program the user-accessible FPGA on the cRIO-9056, the LabVIEW FPGA Module is required.



**Note** C/C++ Development Tools for NI Linux Real-Time is an optional interface for C/C++ programming of the cRIO-9056 processor. Visit [ni.com/r/RIOcdev](https://ni.com/r/RIOcdev) for more information about the C/C++ Development Tools for NI Linux Real-Time. For information on setting up a C/C++ based toolchain, visit [ni.com/r/NILRTCrossCompile](https://ni.com/r/NILRTCrossCompile).

|                 |                                         |
|-----------------|-----------------------------------------|
| Driver software | NI CompactRIO and Drivers 18.1 or later |
|-----------------|-----------------------------------------|

## Network/Ethernet Port

|                          |                                                |
|--------------------------|------------------------------------------------|
| Number of ports          | 1                                              |
| Network interface        | 10Base-T, 100Base-TX, and 1000Base-T Ethernet  |
| Compatibility            | IEEE 802.3                                     |
| Communication rates      | 10 Mb/s, 100 Mb/s, 1,000 Mb/s, auto-negotiated |
| Maximum cabling distance | 100 m/segment                                  |

## Network Timing and Synchronization

|                                  |                                                                  |
|----------------------------------|------------------------------------------------------------------|
| Protocol                         | IEEE 802.1AS-2011<br>IEEE 1588-2008 (default end-to-end profile) |
| Supported Ethernet ports         | Port 0                                                           |
| Network synchronization accuracy | <1 $\mu$ s                                                       |





**Note** Network synchronization is system-dependent. For information about network synchronization accuracy, visit [ni.com/r/criosync](https://ni.com/r/criosync).



**Note** The cRIO-9056 employs time-aware transmission support.

## USB Ports

|                                                                                                    |                                          |
|----------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>Port 1:</b>    |                                          |
| Type                                                                                               | USB Type-C, device port with Console Out |
| USB interface                                                                                      | USB 2.0, Hi-Speed                        |
| Maximum data rate                                                                                  | 480 Mb/s                                 |
| Maximum current (from host)                                                                        | 250 mA                                   |
| <b>Console Out</b>                                                                                 |                                          |
| Baud rate                                                                                          | 115,200 b/s                              |
| Data bits                                                                                          | 8                                        |
| Stop bits                                                                                          | 1                                        |
| Parity                                                                                             | None                                     |
| Flow control                                                                                       | None                                     |
| <b>Port 2:</b>  |                                          |
| Type                                                                                               | USB Type-C, host port                    |
| USB interface                                                                                      | USB 3.1 Gen1, SuperSpeed                 |

|                   |        |
|-------------------|--------|
| Maximum data rate | 5 Gb/s |
| Maximum current   | 900 mA |

## SD Association MicroSD Card Slot

|                            |                                                  |
|----------------------------|--------------------------------------------------|
| MicroSD card support       | MicroSD and MicroSDHC standards                  |
| Supported interface speeds | Full speed, high speed, UHS - I SDR50, and DDR50 |

## Memory

|                               |                 |
|-------------------------------|-----------------|
| Nonvolatile memory (SSD)      | 4 GB            |
| Nonvolatile memory (SSD) type | Planar SLC NAND |



**Note** Visit [ni.com/r/ssdbp](https://ni.com/r/ssdbp) for information about the life span of the nonvolatile memory and about best practices for using nonvolatile memory.

| Volatile memory (DRAM) |       |
|------------------------|-------|
| Density                | 1 GB  |
| Type                   | DDR3L |

|                               |            |
|-------------------------------|------------|
| Maximum theoretical data rate | 8.533 GB/s |
|-------------------------------|------------|

## Reconfigurable FPGA

|                                            |                      |
|--------------------------------------------|----------------------|
| FPGA type                                  | Xilinx Artix-7 7A75T |
| Number of flip-flops                       | 94,400               |
| Number of 6-input LUTs                     | 47,200               |
| Number of DSP slices (18 × 25 multipliers) | 180                  |
| Available block RAM                        | 3,780 kbits          |
| Number of DMA channels                     | 16                   |
| Number of logical interrupts               | 32                   |

## Internal Real-Time Clock

|          |                          |
|----------|--------------------------|
| Accuracy | 200 ppm; 40 ppm at 25 °C |
|----------|--------------------------|



## Controller PFI 0

|                                     |                |
|-------------------------------------|----------------|
| Maximum input or output frequency   | 1 MHz          |
| Cable length                        | 3 m (10 ft)    |
| Cable impedance                     | 50 $\Omega$    |
| PFI 0 connector                     | SMB            |
| Power-on state                      | High impedance |
| I/O standard compatibility          | 5 V TTL        |
| I/O voltage protection              | $\pm 30$ V     |
| <b>Maximum operating conditions</b> |                |
| $I_{OL}$ output low current         | 8 mA maximum   |
| $I_{OH}$ output high current        | -8 mA maximum  |

**Table 1.** DC Input Characteristics

| Voltage                  | Minimum | Maximum |
|--------------------------|---------|---------|
| Positive going threshold | 1.43 V  | 2.28 V  |
| Negative going threshold | 0.86 V  | 1.53 V  |
| Hysteresis               | 0.48 V  | 0.87 V  |

**Table 2.** DC Output Characteristics

| Voltage | Conditions           | Minimum | Maximum |
|---------|----------------------|---------|---------|
| High    | —                    | —       | 5.25 V  |
|         | Sourcing 100 $\mu$ A | 4.65 V  | —       |
|         | Sourcing 2 mA        | 3.60 V  | —       |
|         | Sourcing 3.5 mA      | 3.44 V  | —       |
| Low     | Sinking 100 $\mu$ A  | —       | 0.10 V  |
|         | Sinking 2 mA         | —       | 0.64 V  |
|         | Sinking 3.5 mA       | —       | 0.80 V  |

## Real-Time Streaming Performance

Data throughput is dependent on the application, system, and performance of the removable storage media.

| Data throughput from system memory to target |          |
|----------------------------------------------|----------|
| MicroSD card                                 | 40 MB/s  |
| USB Type-C                                   | 100 MB/s |

## Real-Time (NI-DAQmx) Mode

The following specifications are applicable for modules and slots programmed in Real-Time (NI-DAQmx) mode. For more information about using modules in LabVIEW FPGA mode or Real-Time Scan (I/O Variables) mode, visit [ni.com/r/swsupport](https://ni.com/r/swsupport).

### Analog Input

|                 |                      |
|-----------------|----------------------|
| Input FIFO size | 253 samples per slot |
|-----------------|----------------------|

|                                |                                              |
|--------------------------------|----------------------------------------------|
| Maximum sample rate            | Determined by the C Series module or modules |
| Timing accuracy                | 50 ppm of sample rate                        |
| Timing resolution              | 12.5 ns                                      |
| Number of channels supported   | Determined by the C Series module or modules |
| Number of hardware-timed tasks | 8                                            |



**Note** Maximum sample rate performance is dependent on type of installed C Series module and number of channels in the task.



**Note** Timing accuracy does not include group delay. For more information, refer to the documentation for each C Series module.

## Analog Output

| Hardware-timed tasks           |                                              |
|--------------------------------|----------------------------------------------|
| Number of hardware-timed tasks | 8                                            |
| Number of channels supported   |                                              |
| Onboard regeneration           | 16                                           |
| Non-regeneration               | Determined by the C Series module or modules |
| Non-hardware-timed tasks       |                                              |

|                                    |                                              |  |
|------------------------------------|----------------------------------------------|--|
| Number of non-hardware-timed tasks | Determined by the C Series module or modules |  |
| Number of channels supported       | Determined by the C Series module or modules |  |
| Maximum update rate                | 1.6 MS/s                                     |  |



**Note** Streaming applications are limited by system-dependent factors and the capability of C Series modules.

|                                    |                                          |
|------------------------------------|------------------------------------------|
| Timing accuracy                    | 50 ppm of sample rate                    |
| Timing resolution                  | 12.5 ns                                  |
| Waveform onboard regeneration FIFO | 8,191 samples shared among channels used |
| Waveform streaming FIFO            | 253 samples per slot                     |

## Digital Waveform

|                                                |                      |
|------------------------------------------------|----------------------|
| <b>Waveform acquisition (DI) FIFO</b>          |                      |
| Parallel modules                               | 255 samples per slot |
| Serial modules                                 | 127 samples per slot |
| <b>Waveform onboard regeneration (DO) FIFO</b> |                      |
| <b>Parallel modules</b>                        |                      |

|                                     |                                       |
|-------------------------------------|---------------------------------------|
| Slots 1 to 4                        | 2,047 samples shared among slots used |
| Slots 5 to 8                        | 1,023 samples shared among slots used |
| <b>Waveform streaming (DO) FIFO</b> |                                       |
| Parallel modules                    | 255 samples per slot                  |
| Serial modules                      | 127 samples per slot                  |
| <b>Sample clock frequency</b>       |                                       |
| Digital input                       | 0 MHz to 10 MHz                       |
| <b>Digital output</b>               |                                       |
| ot0:6 timing engine                 | 0 MHz to 3.5 MHz                      |
| ot7 timing engine                   | 0 MHz to 10 MHz                       |



**Note** Streaming applications are limited by system-dependent factors and the capability of C Series modules.

|                                               |        |
|-----------------------------------------------|--------|
| Timing accuracy                               | 50 ppm |
| Number of digital input hardware-timed tasks  | 8      |
| Number of digital output hardware-timed tasks | 8      |

## General-Purpose Counters/Timers

|                               |                                                                                       |
|-------------------------------|---------------------------------------------------------------------------------------|
| Number of counters/timers     | 4                                                                                     |
| Resolution                    | 32 bits                                                                               |
| Counter measurements          | Edge counting, pulse, semi-period, period, two-edge separation, pulse width           |
| Position measurements         | X1, X2, X4 quadrature encoding with Channel Z reloading; two-pulse encoding           |
| Output applications           | Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling |
| Internal base clocks          | 80 MHz, 20 MHz, 13.1072 MHz, 12.8 MHz, 10 MHz, 100 kHz                                |
| External base clock frequency | 0 MHz to 20 MHz                                                                       |
| Base clock accuracy           | 50 ppm                                                                                |
| Output frequency              | 0 MHz to 20 MHz                                                                       |
| Inputs                        | Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down                                           |
| Routing options for           | Any module PFI, controller PFI, analog trigger, many internal signals                 |

|        |                           |
|--------|---------------------------|
| inputs |                           |
| FIFO   | Dedicated 127-sample FIFO |

## Frequency Generator

|                     |                                           |
|---------------------|-------------------------------------------|
| Number of channels  | 1                                         |
| Base clocks         | 20 MHz, 10 MHz, 100 kHz                   |
| Divisors            | 1 to 16 (integers)                        |
| Base clock accuracy | 50 ppm                                    |
| Output              | Any controller PFI or module PFI terminal |

## Module PFI

|                        |                                                                                             |
|------------------------|---------------------------------------------------------------------------------------------|
| Functionality          | Static digital input, static digital output, timing input, and timing output                |
| Timing output sources  | Many analog input, analog output, counter, digital input, and digital output timing signals |
| Timing input frequency | 0 MHz to 20 MHz                                                                             |

|                         |                 |
|-------------------------|-----------------|
| Timing output frequency | 0 MHz to 20 MHz |
|-------------------------|-----------------|



**Note** Actual available timing output source signals are dependent on type of installed C Series module.

## Digital Triggers

|                        |                                                                                      |
|------------------------|--------------------------------------------------------------------------------------|
| Source                 | Any controller PFI or module PFI terminal                                            |
| Polarity               | Software-selectable for most signals                                                 |
| Analog input function  | Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase |
| Analog output function | Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase                    |
| Counter/timer function | Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down                                          |

## Module I/O States

|             |                                                                        |
|-------------|------------------------------------------------------------------------|
| At power-on | Module-dependent. Refer to the documentation for each C Series module. |
|-------------|------------------------------------------------------------------------|



## Time-Based Triggers and Timestamps

|                               |                                                |   |
|-------------------------------|------------------------------------------------|---|
| Number of time-based triggers |                                                | 5 |
| Number of timestamps          |                                                | 6 |
| Analog input                  |                                                |   |
| Time-based triggers           | Start Trigger, Sync Pulse                      |   |
| Timestamps                    | Start Trigger, Reference Trigger, First Sample |   |
| Analog output                 |                                                |   |
| Time-based triggers           | Start Trigger, Sync Pulse                      |   |
| Timestamps                    | Start Trigger, First Sample                    |   |
| Digital input                 |                                                |   |
| Time-based triggers           | Start Trigger                                  |   |
| Timestamps                    | Start Trigger, Reference Trigger, First Sample |   |
| Digital output                |                                                |   |
| Time-based triggers           | Start Trigger                                  |   |
| Timestamps                    | Start Trigger, First Sample                    |   |
| Counter/timer input           |                                                |   |

|                             |                                  |
|-----------------------------|----------------------------------|
| Time-based triggers         | Arm Start Trigger                |
| Timestamps                  | Arm Start Trigger                |
| <b>Counter/timer output</b> |                                  |
| Time-based triggers         | Start Trigger, Arm Start Trigger |
| Timestamps                  | Start Trigger, Arm Start Trigger |

## CMOS Battery

|                                                              |            |
|--------------------------------------------------------------|------------|
| Typical battery life with power applied to power connector   | 10 years   |
| Typical battery life when stored at temperatures up to 25 °C | 3.66 years |
| Typical battery life when stored at temperatures up to 85 °C | 3.20 years |

## Battery

Replace the battery with the following battery or an equivalent one.

|              |         |
|--------------|---------|
| Manufacturer | Rayovac |
| Model        | BR2032  |

|                                |                                   |
|--------------------------------|-----------------------------------|
| Quantity                       | 1                                 |
| Cell chemistry system          | Lithium carbon mono-fluoride (BR) |
| IEC number                     | BR2032                            |
| Minimum reverse charge current | 3 mA                              |

## Power Requirements



**Note** Some C Series modules have additional power requirements. For more information about C Series module power requirements, refer to the C Series module(s) documentation.



**Note** Sleep mode for C Series modules is not supported in Real-Time (DAQmx) Mode.

|                                                                 |                   |
|-----------------------------------------------------------------|-------------------|
| Voltage input range (measured at the cRIO-9056 power connector) | 9 V DC to 30 V DC |
| Maximum power consumption                                       | 30 W              |



**Note** The C terminal of the power connector is functionally isolated from chassis ground to prevent ground loops, but does not meet IEC 61010-1 for safety isolation



**Note** The maximum power consumption specification is based on a fully populated system running a high-stress application at elevated ambient

temperature and with all C Series modules and USB devices consuming the maximum allowed power.

|                                   |                        |
|-----------------------------------|------------------------|
| Typical standby power consumption | 3.4 W at 24 V DC input |
| Recommended power supply          | 60 W, 24 V DC          |



**Notice** Include a switch or circuit breaker in the installation to disconnect the system from DC Mains. The switch or circuit breaker must be suitably rated, accessible, and marked as the disconnecting device for the system.

|                                                         |                                                                                            |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------|
| EMC ratings for voltage input as described in IEC 61000 | Short lines, long lines, and DC distributed networks                                       |
| Power input connector                                   | 2-position, 3.5 mm pitch, pluggable screw terminal with screw locks, Sauro CTF02BV8-AN000A |

## Physical Characteristics

|                               |                                                                                     |
|-------------------------------|-------------------------------------------------------------------------------------|
| Weight (unloaded)             | 1,598 g (3 lb 8 oz)                                                                 |
| Dimensions (unloaded)         | 328.7 mm × 82.5 mm × 189.6 mm (12.94 in. × 3.25 in. × 3.53 in.)                     |
| <b>Power connector wiring</b> |                                                                                     |
| Gauge                         | 0.5 mm <sup>2</sup> to 2.1 mm <sup>2</sup> (20 AWG to 14 AWG) copper conductor wire |

|                             |                                                         |
|-----------------------------|---------------------------------------------------------|
| Wire strip length           | 6 mm (0.24 in.) of insulation stripped from the end     |
| Temperature rating          | 85 °C                                                   |
| Torque for screw terminals  | 0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.) |
| Wires per screw terminal    | One wire per screw terminal                             |
| <b>Connector securement</b> |                                                         |
| Securement type             | Screw flanges provided                                  |
| Torque for screw flanges    | 0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.) |
| Insulation rating           | 300 V, maximum                                          |

## Safety Voltages

Connect only voltages that are below these limits.

|                              |               |
|------------------------------|---------------|
| V terminal to C terminal     | 30 V, maximum |
| Chassis ground to C terminal | 30 V, maximum |

## Environmental Characteristics

|             |
|-------------|
| Temperature |
|-------------|

|                     |  |                                                                          |         |
|---------------------|--|--------------------------------------------------------------------------|---------|
| Operating           |  | -20 °C to 55 °C                                                          |         |
| Storage             |  | -40 °C to 85 °C                                                          |         |
| Humidity            |  |                                                                          |         |
| Operating           |  | 10% RH to 90% RH, noncondensing                                          |         |
| Storage             |  | 5% RH to 95% RH, noncondensing                                           |         |
| Ingress protection  |  |                                                                          | IP40    |
| Pollution Degree    |  |                                                                          | 2       |
| Maximum altitude    |  |                                                                          | 5,000 m |
| Shock and Vibration |  |                                                                          |         |
| Operating vibration |  |                                                                          |         |
| Random              |  | 5 g RMS, 10 Hz to 500 Hz                                                 |         |
| Sinusoidal          |  | 5 g, 10 Hz to 500 Hz                                                     |         |
| Operating shock     |  | 30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations |         |

To meet these shock and vibration specifications, you must panel mount the system.