C Series Analog Input Modules

NI 9201, NI 921x, NI 9221, NI 923x

- Signal conditioning for high voltage (±60 V), thermocouples, RTDs, accelerometers, microphones, strain gages, current inputs
- Advanced features such as smart TEDS sensor capability, antialiasing filters, open-thermocouple detection
- ±80 mV, ±10 V, or ±60 V analog input ranges
- 12-, 16-, or 24-bit (delta-sigma) resolution
- Up to 800 kS/s multiplexed or up to 100 kS/s simultaneous-sampling analog-to-digital converter (ADC)
- Up to 32 channels per module
- Up to 2,300 Vrms isolation (withstand), up to 250 Vrms isolation (continuous)
- NIST-traceable calibration certificate for guaranteed accuracy

Overview
High-accuracy C Series analog input modules for National Instruments CompactRIO and NI CompactDAQ provide high-performance measurements for a wide variety of industrial, in-vehicle, and laboratory sensors and signal types. Each module includes built-in signal conditioning and an integrated connector with screw terminal or cable options for flexible and low-cost signal wiring. All modules feature NI CompactRIO Extreme Industrial Certifications and Ratings.

System Compatibility
You can use NI C Series modules in multiple system types depending on available software. See Table 1 for CompactRIO and NI CompactDAQ module compatibility because not all modules work with both systems. Many of the advanced features described apply only to reconfigurable I/O systems and not to NI CompactDAQ.

Advanced Features
When used with CompactRIO, NI C Series analog input modules connect directly to reconfigurable I/O (RIO) FPGA hardware to create high-performance embedded systems. The reconfigurable FPGA hardware within CompactRIO provides a variety of options for custom timing, triggering, synchronization, filtering, signal processing, and high-speed decision making for all C Series analog modules. For instance, with CompactRIO, you can implement custom triggering for any analog sensor type on a per-channel basis using the flexibility and performance of the FPGA and the numerous arithmetic and comparison function blocks built into NI LabVIEW FPGA.

Key Features
- High-accuracy, high-performance analog measurements for any CompactRIO embedded system, R Series expansion chassis, or NI CompactDAQ chassis
- Screw terminals, BNC, D-Sub, spring terminals, strain relief, high-voltage, cable, solder cup backshell, and other connectivity options
- Available channel-to-earth ground double-isolation barrier for safety, noise immunity, and high common-mode voltage range
- CompactRIO Extreme Industrial Certifications and Ratings
- Built-in signal conditioning for direct connection to sensors and industrial devices

Visit ni.com/compactrio or ni.com/compactdaq for up-to-date information on module availability, example programs, application notes, and other developer tools.

Table 1: C Series Analog Input Modules Selection Guide

<table>
<thead>
<tr>
<th>Model</th>
<th>CompactRIO</th>
<th>NI CompactDAQ</th>
<th>Signal Type</th>
<th>Channels</th>
<th>Resolution (bits)</th>
<th>Max Sampling Rate (S/s)</th>
<th>Signal Input Ranges</th>
<th>Simultaneous Sampling</th>
<th>Antialiasing Filters</th>
<th>Isolation</th>
<th>Connector Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9201</td>
<td>✓</td>
<td>✓</td>
<td>Voltage</td>
<td>8</td>
<td>12</td>
<td>500 k</td>
<td>±10 V</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Screw Terminal, D-Sub</td>
</tr>
<tr>
<td>NI 9203</td>
<td>✓</td>
<td>✓</td>
<td>Current</td>
<td>8</td>
<td>16</td>
<td>200 k</td>
<td>±20 mA, 0 to 20 mA</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Screw Terminal</td>
</tr>
<tr>
<td>NI 9205</td>
<td>✓</td>
<td>✓</td>
<td>Voltage</td>
<td>32 SE/16 DI</td>
<td>16</td>
<td>250 k</td>
<td>±10, ±5, ±1, ±0.2 V</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Spring Terminal, D-Sub</td>
</tr>
<tr>
<td>NI 9206</td>
<td>✓</td>
<td>✓</td>
<td>CAT I Isolated</td>
<td>Voltage</td>
<td>16 DI</td>
<td>250 k</td>
<td>±10, ±5, ±1, ±0.2 V</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Spring Terminal</td>
</tr>
<tr>
<td>NI 9211</td>
<td>✓</td>
<td>✓</td>
<td>Thermocouple</td>
<td>4</td>
<td>24</td>
<td>15</td>
<td>±80 mV</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Screw Terminal</td>
</tr>
<tr>
<td>NI 9215</td>
<td>✓</td>
<td>✓</td>
<td>Voltage</td>
<td>4</td>
<td>16</td>
<td>100 k/ch</td>
<td>±10 V</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>Screw Terminal, BNC</td>
</tr>
<tr>
<td>NI 9217</td>
<td>✓</td>
<td>✓</td>
<td>RTD</td>
<td>4</td>
<td>24</td>
<td>400</td>
<td>0 to 400 Ω</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Screw Terminal</td>
</tr>
<tr>
<td>NI 9221</td>
<td>✓</td>
<td>✓</td>
<td>Voltage</td>
<td>8</td>
<td>12</td>
<td>800 k</td>
<td>±80 V</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>Screw Terminal, D-Sub</td>
</tr>
<tr>
<td>NI 9233</td>
<td>✓</td>
<td>✓</td>
<td>IEPE</td>
<td>4</td>
<td>24</td>
<td>50 k/ch</td>
<td>±5 V</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>BNC</td>
</tr>
<tr>
<td>NI 9237</td>
<td>✓</td>
<td>✓</td>
<td>Bridge</td>
<td>4</td>
<td>24</td>
<td>50 k/ch</td>
<td>±250 mV</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>RJ50</td>
</tr>
</tbody>
</table>

Table 1: C Series Analog Input Modules Selection Guide
C Series Module Accessories

Connectivity Accessories
CompactRIO and NI CompactDAQ systems are designed to provide flexible options for low-cost field wiring and cabling. Most C Series modules have a unique connector block option that offers secure and safe connections to your C Series system. Table 2 contains all of the connector blocks available for C Series I/O modules.

Table 2. Connector Blocks for C Series I/O Modules

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9932</td>
<td>10-position strain relief and high-voltage screw-terminal connector kit</td>
</tr>
<tr>
<td>NI 9933</td>
<td>37-pin D-Sub connector kit with strain relief and D-Sub shell</td>
</tr>
<tr>
<td>NI 9934</td>
<td>25-pin D-Sub connector kit with strain relief and D-Sub shell</td>
</tr>
<tr>
<td>NI 9935</td>
<td>15-pin D-Sub connector kit with strain relief and D-Sub shell</td>
</tr>
<tr>
<td>NI 9936</td>
<td>10-position screw-terminal plugs (quantity 10)</td>
</tr>
<tr>
<td>NI 9939</td>
<td>16-position connector kit with strain relief</td>
</tr>
</tbody>
</table>

Note: To meet shock and vibration requirements, you must affix ferrules to the ends of the wires on all screw-terminal connectors.

Table 3. Recommended Connector Block Accessories

Table 3 lists the recommended connector block accessories for each C Series analog input module.

<table>
<thead>
<tr>
<th>C Series Analog Input Module</th>
<th>Recommended Module Accessory</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9201</td>
<td>NI 9932, NI 9936</td>
</tr>
<tr>
<td>NI 9201 with D-Sub</td>
<td>NI 9934(^1)</td>
</tr>
<tr>
<td>NI 9211</td>
<td>NI 9932, NI 9936</td>
</tr>
<tr>
<td>NI 9215</td>
<td>NI 9932, NI 9936</td>
</tr>
<tr>
<td>NI 9217</td>
<td>NI 9939</td>
</tr>
<tr>
<td>NI 9221</td>
<td>NI 9932, NI 9936</td>
</tr>
<tr>
<td>NI 9221 with D-Sub</td>
<td>NI 9934(^1)</td>
</tr>
</tbody>
</table>

\(^1\)Requires a 25-pin D-Sub connector such as the NI 9934 accessory kit.

The NI 9932 kit provides strain relief and operator protection from high-voltage signals for any 10-position screw-terminal module.

The NI 9933 includes a screw-terminal connector with strain relief as well as a D-Sub solder cup backshell for creating custom cable assemblies for any module with a 37-pin D-Sub connector.

The NI 9934 includes a screw-terminal connector with strain relief as well as a D-Sub solder cup backshell for creating custom cable assemblies for any module with a 25-pin D-Sub connector.

The NI 9935 includes a screw-terminal connector with strain relief as well as a D-Sub solder cup backshell for creating custom cable assemblies for any module with a 15-pin D-Sub connector.

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C Series Module Accessories

The NI 9936 consists of 10-position screw-terminal plugs for any 10-position screw-terminal module.

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## CompactRIO Ordering Information

### Ordering Information

#### Developer Kits
- **NI cRIO-9001 Embedded System Developer**
  - Hardware Evaluation Kit ........................................... 779107-01
- **NI Reconfigurable I/O**
  - Software Development Kit ........................................... 779149-03

### Reconfigurable Embedded Systems

#### Real-Time Controllers
- **NI cRIO-9002** .......................................................... 779000-01
- **NI cRIO-9004** .......................................................... 779055-01

#### Reconfigurable Chassis
- **NI cRIO-9101** .......................................................... 779052-01
- **NI cRIO-9102** .......................................................... 779007-01
- **NI cRIO-9103** .......................................................... 779053-01
- **NI cRIO-9104** .......................................................... 779054-01

#### Power Supplies
- **NI PS-1** ................................................................. 777567-01
- **NI PS-2** ................................................................. 777584-01
  - **North American 240 VAC** ...................................... 777584-05
  - **North American 100 VAC** ...................................... 777586-01
  - **North American 100 VAC** ...................................... 777586-05
- **NI PS-3** ................................................................. 778686-90
- **NI PS-4** ................................................................. 778685-01
- **NI PS-5** ................................................................. 778685-90

### R Series Expansion Systems

#### Expansion Chassis
- **NI cRIO-9151 chassis** .............................................. 779008-01
- **SH68-C68-S cable, 2 m** ............................................ 186381-02

### R Series Devices

#### PCI
- **NI PCI-7811R digital I/O** ........................................... 779363-01
- **NI PCI-7813R digital I/O** ........................................... 779370-01
- **NI PCI-7830R multifunction I/O** ................................ 779361-01
- **NI PCI-7831R multifunction I/O** ................................ 778797-01
- **NI PCI-7833R multifunction I/O** ................................ 779359-01

#### PXI
- **NI PXI-7811R digital I/O** ........................................... 779800-01
- **NI PXI-7813R digital I/O** ........................................... 779936-02
- **NI PXI-7830R multifunction I/O** ................................ 779364-01
- **NI PXI-7831R multifunction I/O** ................................ 778668-01
- **NI PXI-7833R multifunction I/O** ................................ 779360-01

### C Series Modules

#### Analog Input Modules
- **NI 9201** ............................................................... 779013-01
- **NI 9201 with D-Sub** ............................................... 779372-01
- **NI 9203** ............................................................... 779516-01
- **NI 9205** ............................................................... 779519-01
- **NI 9205 with D-Sub** ............................................... 779357-01
- **NI 9206** ............................................................... 779526-01

### Analog Output Module
- **NI 9211** ............................................................... 779001-01
- **NI 9215** ............................................................... 779011-01
- **NI 9215 with BNC** ................................................... 779138-01
- **NI 9217** ............................................................... 779592-01
- **NI 9221** ............................................................... 779014-01
- **NI 9221 with D-Sub** ............................................... 779373-01
- **NI 9233** ............................................................... 779015-01
- **NI 9237** ............................................................... 779521-01

### Digital Input and Counter/Timer Modules
- **NI 9401** ............................................................... 779351-01
- **NI 9411** ............................................................... 779005-01
- **NI 9421** ............................................................... 779002-01
- **NI 9421 with D-Sub** ............................................... 779136-01
- **NI 9422** ............................................................... 779522-01
- **NI 9423** ............................................................... 779009-01
- **NI 9425** ............................................................... 779391-01
- **NI 9435** ............................................................... 779010-01

### Digital Output and Relay Modules
- **NI 9401** ............................................................... 779351-01
- **NI 9402** ............................................................... 779004-01
- **NI 9427 with D-Sub** ............................................... 779137-01
- **NI 9474** ............................................................... 779003-01
- **NI 9476** ............................................................... 779140-01
- **NI 9477** ............................................................... 779517-01
- **NI 9481** ............................................................... 779006-01

### Accessories
- **NI 9912** ............................................................... 779019-01
- **NI 9915** ............................................................... 779018-01
- **NI 9917** ............................................................... 779454-01
- **NI 9918** ............................................................... 779455-01
- **NI 9932** ............................................................... 779017-01
- **NI 9933** ............................................................... 779103-01
- **NI 9934** ............................................................... 779104-01
- **NI 9935** ............................................................... 779106-01
- **NI 9936** ............................................................... 192692-01
- **NI 9937** ............................................................... 779105-01
- **NI 9938** ............................................................... 779106-01
- **NI 9939** ............................................................... 192692-01

### Ethernet Cables
- **CAT 5** ................................................................. 182219-05
- **CAT 5 Crossover** ..................................................... 187375-05

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## Ordering Information

### System Chassis

- **NI cDAQ-9172**
  - U.S. (120 VAC) ................................................................. 779508-01
  - Switzerland (220 VAC) .................................................... 779508-02
  - Australia (240 VAC) ........................................................ 779508-03
  - Europe (240 VAC) ............................................................ 779508-04
  - UK (240 VAC) ................................................................... 779508-06
  - Japan (100 V) ................................................................... 779508-07

### C Series Modules

#### Analog Input Modules
- NI 9205 ............................................................................. 779519-01
- NI 9205 with D-Sub .......................................................... 779357-01
- NI 9206 ............................................................................. 779526-01
- NI 9211 ............................................................................. 779001-01
- NI 9215 ............................................................................. 779011-01
- NI 9215 with BNC .............................................................. 779138-01
- NI 9233 ............................................................................. 779015-01
- NI 9237 ............................................................................. 779521-01

#### Analog Output Module
- NI 9263 ............................................................................. 779012-01

#### Digital Input Modules
- NI 9401 ............................................................................. 779351-01
- NI 9421 ............................................................................. 779002-01
- NI 9421 with D-Sub .......................................................... 779136-01

#### Digital Output and Relay Modules
- NI 9401 ............................................................................. 779351-01
- NI 9472 ............................................................................. 779004-01
- NI 9472 with D-Sub .......................................................... 779137-01
- NI 9481 ............................................................................. 779006-01

### Accessories

- NI 9915 ............................................................................. 779018-01
- NI 9901 ............................................................................. 779473-01
- NI 9933 ............................................................................. 779103-01
- NI 9940 ............................................................................. 779567-01
- NI 9941 ............................................................................. 779568-01
- NI 9917 ............................................................................. 779454-01
- NI 9918 ............................................................................. 779455-01
- NI 9932 ............................................................................. 779017-01
- NI 9936 ............................................................................. 779105-01

### Academic Bundles

- Standard Bundle .............................................................. 777448-60
- Instrumentation Bundle .................................................... 777448-61
- DSA (Sound and Vibration) Bundle .................................... 777448-62

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