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USER GUIDE

SCC-CI20 Current Input Module

The SCC-CI20 converts current to voltage by passing it through a precision 249 Ω resistor and sending the resulting voltage to the E Series DAQ device as a 0 to +5 V signal. The SCC-CI20 accepts up to two current sources at a maximum of 20 mA. A differential instrumentation amplifier buffers each input signal.

Conventions

The following conventions are used in this guide:

<> — Angle brackets that contain numbers separated by an ellipsis represent a range of values associated with a bit or signal name—for example, P1.<3..0>.

» — The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

 — This icon denotes a note, which alerts you to important information.

 — This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. When this symbol is marked on the product, refer to the *Read Me First: Safety and Radio-Frequency Interference* document, shipped with the product, for precautions to take.

 — When symbol is marked on a product, it denotes a warning advising you to take precautions to avoid electrical shock.

 — When symbol is marked on a product, it denotes a component that may be hot. Touching this component may result in bodily injury.

bold — Bold text denotes items that you must select in software, such as menu items and dialog box options. Bold text also denotes parameter names.

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italic	Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.
SC-2345	SC-2345 refers to both the SC-2345 connector block and configurable connector.
SCC	SCC refers to any SCC Series signal conditioning module.

What You Need to Get Started

To set up and use the SCC-CI20, you need the following items:

- ❑ SC-2345/2350 with one of the following:
  - SCC-PWR01
  - SCC-PWR02 and the PS01 power supply
  - SCC-PWR03—requires a 7 to 42 VDC power supply (not included)
- ❑ One or more SCC-CI20 modules
- ❑ *SC-2345/2350 User Manual*, available at `ni.com`
- ❑ *SCC-CI20 Current Input Module User Guide*
- ❑ *SCC Quick Start Guide*, available at `ni.com`
- ❑ *Read Me First: Safety and Radio-Frequency Interference*
- ❑ SC-2345 Quick Reference Label
- ❑ 68-pin E Series DAQ device, documentation, and 68-pin cable
- ❑ 1/8 in. flathead screwdriver
- ❑ Numbers 1 and 2 Phillips-head screwdrivers
- ❑ Wire insulation strippers
- ❑ NI-DAQ (current version) for Windows 2000/NT/XP/Me

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Note Software scaling of measurements is not supported on the Macintosh operating system. Refer to the *Specifications* section for more information.

Device Specific Information

Note For general SCC module installation and signal connection information, and information about the SC-2350 carrier, refer to the *SCC Quick Start Guide*, available for download at `ni.com/manuals`.

Installing the Module

Caution Refer to the *Read Me First: Safety and Radio-Frequency Interference* document before removing equipment covers or connecting/disconnecting any signal wires.

You can plug the SCC-CI20 into any analog input socket on the SC-2345. It can function either as a single-stage module or as the first stage of a dual-stage signal conditioning configuration. The socket you choose determines which E Series DAQ device channels receive the SCC-CI20 signals.

For single-stage input conditioning, plug the SCC-CI20 into any socket J(*X*+1), where *X* is 0 to 7, and connect the input signals to the module as described in the *Connecting the Input Signals* section.

If you use the SCC-CI20 in a dual-stage configuration, you *must* use it as the first stage. Plug the SCC-CI20 into any socket J(*X*+9) and plug the second-stage SCC into socket J(*X*+1), where *X* is 0 to 7. Connect the input signals to the SCC-CI20 as described in the *Connecting the Input Signals* section. The SC-2345 connects the output signals of the SCC-CI20 to the inputs of the second-stage SCC. One example of a second-stage module compatible with the SCC-CI20 is a lowpass filter module (SCC-LP*XX*).

Sockets J9 to J16 are also available for digital input/output (DIO) conditioning or control. Refer to the *SC-2345/2350 User Manual* for more information on configuring, connecting, and installing SCC modules.

Connecting the Input Signals

Note The signal names have changed. Refer to `ni.com/info` and enter `rdtntg` to confirm the signal names.

Each screw terminal is labeled by pin number <1..4>. Pins 1 and 2 form a differential channel routed to E Series DAQ device channel *X*+8, and pins 3 and 4 form a second differential channel routed to E Series DAQ device

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channel *X*. The value of *X* is determined by the number of the SC-2345 socket, J(*X*+1) or J(*X*+9), where you plug in the SCC-CI20. Figure 1 shows the SCC-CI20 signal connections.

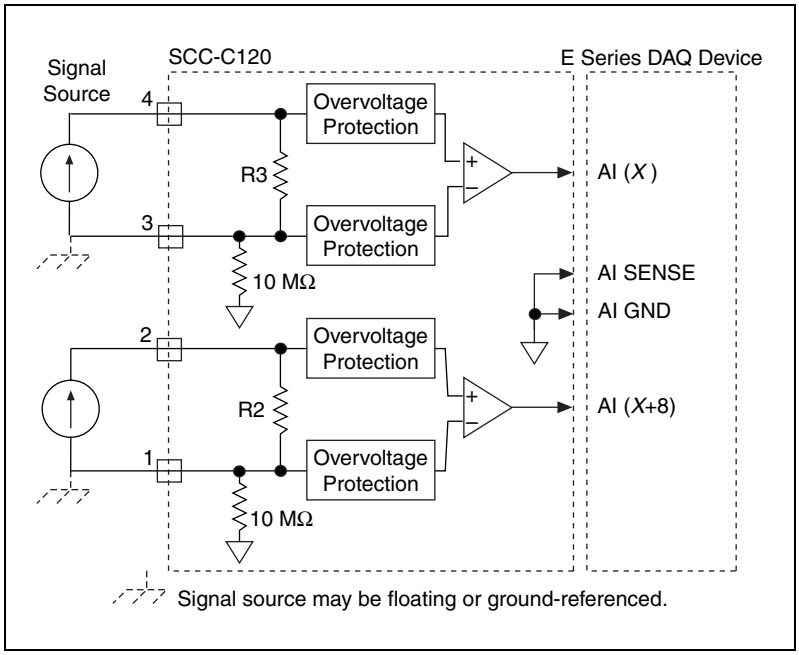


Figure 1. SCC-CI20 Signal Connections

The input signal source can be floating or ground-referenced. The SCC-CI20 has high-impedance bias resistors typically required for floating sources, so you do not need external bias resistors referenced to ground.

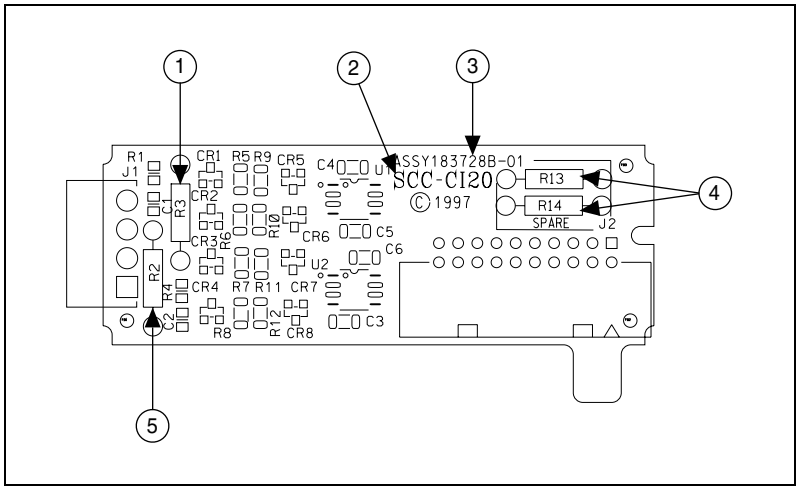
Replacing the Input Resistors

Incorrect connections can damage the input resistors and possibly other components of the module. Spare 249 Ω resistors are available inside the SCC-CI20. To open the SCC-CI20, complete the following steps:

1. Remove the screw from the back (wide unlabeled side).
2. Turn the front (wide labeled side) toward you.
3. Place the screw-terminal receptacle to the left.
4. Slide the top cover to the right.
5. Lift off the cover.

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The input resistors are socketed so that you can replace them when necessary. Figure 2 shows the locations of the input and spare resistors.



1	Input Resistor for AI (*X*)	4	Spare Resistors
2	Product Name	5	Input Resistor for AI (*X*+8)
3	Assembly Number		

Figure 2. SCC-CI20 Parts Locator Diagram

For information about how to configure the SCC-CI20 module using NI-DAQmx, refer to the *SCC Quick Start Guide*.

Using the SC-C120 when Scaling Voltage Measurements

If you configured the SCC-CI20 using Measurement & Automation Explorer (MAX) and you are using NI-DAQ, the reading you get from the E Series DAQ device accounts for the voltage-to-current conversion and returns milliamps, not volts. Otherwise you must convert the raw voltage measurement to a current measurement. To make this conversion, use the following formula:

$$I = \frac{V}{0.249}$$

where I is in milliamps and V is in volts.

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Specifications

These ratings are typical at 25 °C unless otherwise stated.

Analog Input

Number of input channels.....2 DIFF

Input range.....0 to 20 mA

Input resistor

- Value.....249 Ω
- Tolerance.....0.05%
- Temperature coefficient of resistance.....10 ppm/°C
- Maximum power dissipation.....0.25 W

Maximum input current.....32 mA

Output range.....0 to +5 V

Output slew rate.....0.75 V/µs min

Gain error.....±0.1% max[1]

Temperature stability of gain error.....±0.006%/°C max

Offset error.....±0.6 mV max[1]

Temperature stability of offset error.....±21 µV/°C max

Dynamic Response

Bandwidth (–3 dB, amplitude ≤4 mA) ...10 kHz

Output slew rate.....0.75 V/µs min

[1] Temperature range is 23 °C ± 5 °C.

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Power Requirement

Analog power ..... 100 mW max
+15 V ..... 3.2 mA max
–15 V ..... 3.2 mA max

Digital power (+5 V) ..... 0.0 mW

Operating voltage range
+15 V ..... ±10%
–15 V ..... ±10%

Physical

Dimensions ..... 8.89 cm × 2.92 cm × 1.85 cm (3.50 in. × 1.15 in. × 0.73 in.)

I/O connectors ..... One 20-pin right-angle male connector, one 4-pin screw terminal

Wire gauge range ..... 28 to 16 AWG

Maximum Working Voltage

Maximum working voltage refers to the signal voltage ($I \times 249\ \Omega$) plus the common-mode voltage.

Channel-to-earth ..... ±15 V, Installation Category I

Channel-to-channel ..... ±15 V, Installation Category I

Environmental

Operating temperature ..... 0 to 50 °C

Storage temperature ..... –20 to 70 °C

Humidity ..... 10 to 90% RH, noncondensing

Maximum altitude ..... 2,000 m

Pollution Degree (indoor use only) 2

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Safety

The SCC-CI20 is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 3111-1, UL 61010B-01
- CAN/CSA C22.2 No. 1010.1

Note For UL and other safety certifications, refer to the product label, or visit `ni.com/hardref.nsf`, search by model number or product line and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions.....EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity .....EN 61326:1997 + A2:2001, Table 1

CE, C-Tick, and FCC Part 15 (Class A) Compliant

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety).....73/23/EEC

Electromagnetic Compatibility
Directive (EMC) 89/336/EEC

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/hardref.nsf`, search by model number or product line, and click the appropriate link in the Certification column.

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SCC-CI20 Module Pin Assignments

Figure 3 shows the I/O connector pins on the bottom of the module.

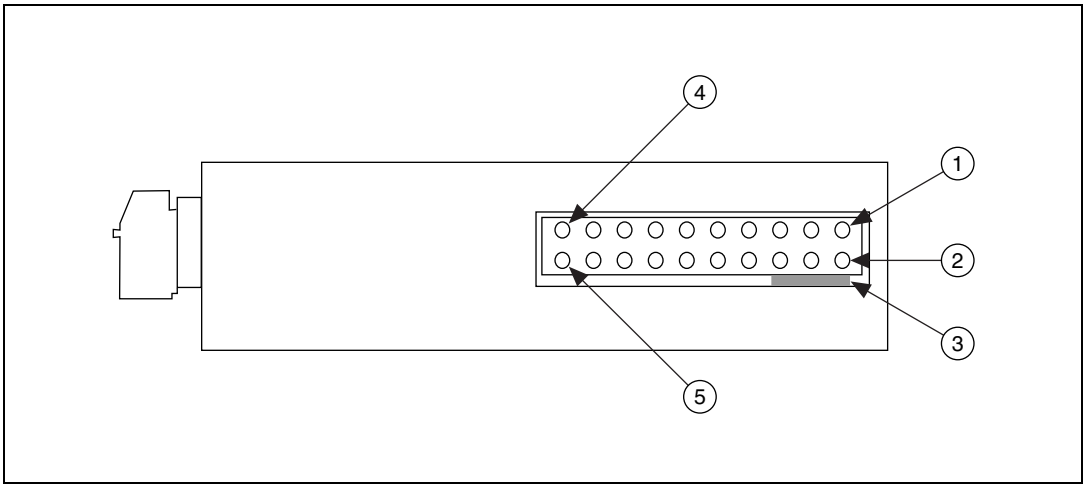


Figure 3. SCC Module Bottom View

Table 1 lists the signal connection corresponding to each pin. AI (*X*) and AI (*X*+8) are the analog input signal channels of the E Series DAQ device. AI GND is the analog input ground signal and is the reference for AI (*X*) and AI (*X*+8). A GND is the reference for the ±15V supplies. AI GND and A GND connect to the SC-2345 at the SCC-PWR connector. Pins 17 to 20 accept signals from a first-stage module if you are cascading two modules.

Table 1. SCC-CI20 Pin Signal Assignments

Pin Number	Signal
1	E Series AI (*X*)
2	E Series AI GND
3	—
4	E Series AI (*X*+8)
5	—
6	E Series AI GND
7	—
8	E Series AI GND

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Table 1. SCC-CI20 Pin Signal Assignments (Continued)

Pin Number	Signal
9	—
10	—
11	E Series A GND
12	—
13	+15 V
14	–15 V
15	—
16	—
17	AI (*X*)– (from first stage)
18	AI (*X*+8)+ (from first stage)
19	AI (*X*)+ (from first stage)
20	AI (*X*+8)– (from first stage)

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