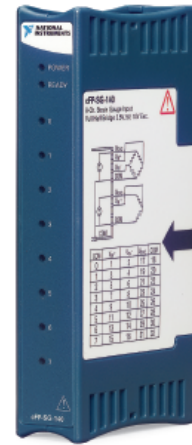


# Strain Gage Module for Compact FieldPoint

## NI cFP-SG-140

- Accepts full- and half-bridge strain gage inputs directly
- Quarter-bridge gages require external bridge-completion resistor
- Compatible with load cells, force sensors, and torque sensors
- Built-in signal conditioning
  - 15, 60, and 240 Hz noise rejection
  - Pulsed excitation to prevent self-heating
- 16-bit resolution
- Input ranges software-configurable per channel
- 2,300 V<sub>rms</sub> bank isolation for transient overvoltage protection
- Hot-swappable with autoconfiguration
- -40 to 70 °C operating range



Module	Input Channels	Resolution	Input Ranges (Software-Configurable per Channel)	15/60/240 Hz Noise Filter	All Channel Update Rate <sup>1</sup>
cFP-SG-140	8	16 bits	±3.5 mV/V, ±7.5 mV/V, ±30 mV/V, ±60 mV/V	Software selectable	1.11 to 0.87 Hz (rate varies with filter settings)

<sup>1</sup>The all-channel update rate refers to the time the module takes to sample all channels. The overall system update rate is affected by other factors, such as the aggregate module update rate and software loop rate. To calculate the system update rate, visit [ni.com/info](http://ni.com/info) and enter "systemrate."

## Overview

The National Instruments cFP-SG-140 is a versatile resistance bridge input module for Compact FieldPoint that you can use to measure values from resistor bridges including full- and half-bridge strain gages, quarter-bridge strain gages (using an external completion register), and load and torque sensors. The NI cFP-SG-140 includes built-in excitation, overranging, and onboard diagnostics to ensure trouble-free installation and maintenance. The module measures and linearizes signals on board to return scaled values to your control or monitoring software. The cFP-SG-140 comes with a NIST-traceable calibration certificate, ensuring accurate and reliable analog measurements.

## Strain Gage

With the cFP-SG-140, you can connect directly to industrial sensors or units under test and get high-accuracy measurements. The module filters, calibrates, and scales raw sensor signals to engineering units, as well as performs self-diagnostics to look for problems with the module or wiring. With the cFP-SG-140 module, your software application reads a linearized, calibrated, and scaled value from the I/O module, eliminating the error-prone step of converting binary values.

Because the cFP-SG-140 measures in units of millivolts per volt, it can interface with a wide variety of transducers, such as load cells and pressure sensors. The module uses a pulsed excitation of up to 21 mA per channel that turns on and off the excitation to each channel. This reduces self-heating effects and provides more accurate and repeatable strain measurements. The cFP-SG-140 also offers true ratiometric readings to

eliminate errors caused by variations in excitation voltage. You can configure each channel on the module for a different excitation level of 2.5, 5, or 10 V. For increased accuracy and noise rejection, the cFP-SG-140 uses a 16-bit delta-sigma ADC with an integrated lowpass filter on each channel, which you can configure for 15, 60, or 240 Hz. With a high-accuracy 16-bit delta-sigma ADC, you also get instrument-quality measurements on an industrially rugged, distributed, embedded system.

The cFP-SG-140 has three update rates to fit your application, ranging from 0.87 to 1.11 Hz. These rates vary based on the noise filter setting selected on the module. Overall data throughput depends on software loop speeds and network speeds. With overranging and underranging, the modules can zero out unstrained readings in software to compensate for field devices with span errors of up to 12 percent.

## Isolation

The cFP-SG-140 features optical bank isolation with 2,300 V<sub>rms</sub> of breakdown isolation. These Compact FieldPoint modules do not have channel-to-channel isolation.

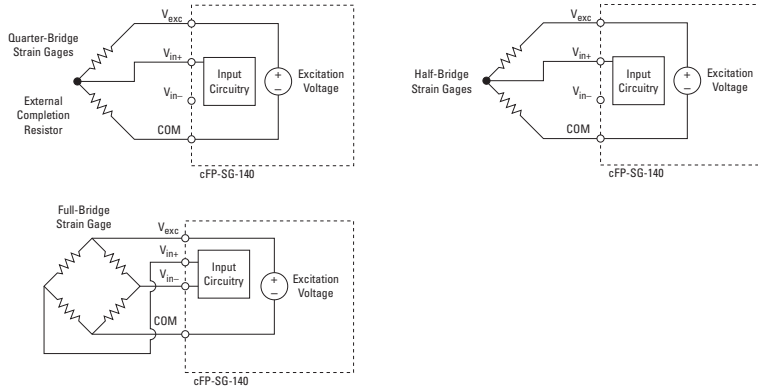
## Field I/O Connections

Compact FieldPoint modules include a built-in power distribution bus that provides multiple power connections on the module. A field-wired power supply connected to the voltage (V) and common (C) terminals is internally connected to a power distribution bus that offers additional breakout terminals for voltage supply (V<sub>SUP</sub>) and common (COM). These terminals deliver a convenient way to distribute power to field devices that require external power.

# Strain Gage Module for Compact FieldPoint

Each input channel on the cFP-SG-140 has four terminals:

1. Excitation voltage output ( $V_{exc}$ )
2. Positive signal input ( $V_{in+}$ )
3. Negative signal input ( $V_{in-}$ )
4. Common input (COM)



Wiring Schematic for the cFP-SG-140 Module

## Ordering Information

NI cFP-SG-140 .....777318-140

### Recommended Compact FieldPoint System Products

NI cFP-2120 .....777317-2120

NI cFP-BP-4 .....778617-04

NI cFP-CB-1 .....778618-01

NI PS-5 power supply .....778805-90

NI Developer Suite Professional Control Edition .....777906-03

## BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to [ni.com/compactfieldpoint](http://ni.com/compactfieldpoint).

# Strain Gage Module for Compact FieldPoint

## Specifications

Typical for -40 to 70 °C unless otherwise noted.

### Input Characteristics

Number of inputs .....	8 differential
Resolution .....	16 bits, 1 in 65,536
Type of ADC .....	Delta-sigma
Filters.....	15, 60, 240 Hz, user-selectable
Excitation voltage .....	2.5, 5, 10 V, user-selectable, current-limited to 21 mA per channel
Bridge configurations.....	Half- and full-bridge circuits, quarter-bridge with external completion resistor
Gage factor .....	Any (software value)
Input impedance .....	20 MΩ
Offset error	
15 to 35 °C .....	7.6 μV typ, 28 μV max
-40 to 70 °C.....	50 μV typ, 140 μV max
Gain error	
15 to 35 °C .....	0.06%
-40 to 70 °C.....	0.4%
Input noise (60 Hz filter)	
±3.5 mV/V .....	±3 LSB <sub>pp</sub>
±7.5 mV/V .....	±2 LSB <sub>pp</sub>
Other ranges .....	±1 LSB <sub>pp</sub>
All-channel update periods	
15 Hz .....	1.15 s
60 Hz .....	0.95 s
240 Hz .....	0.90 s

### Isolation Voltage

Maximum isolation voltage .....	250 V <sub>rms</sub> , Installation Category II
Channel-to-channel isolation.....	No isolation between channels
Transient overvoltage.....	2,300 V <sub>rms</sub>

### Physical Characteristics

LED indicators	
POWER (green) .....	Power on and self-test passed
READY (green) .....	Module configured and ready
OVERCURRENT (red).....	Overcurrent condition on channel
Dimensions	
(including terminal base) .....	10.9 by 10.7 by 9.1 cm (4.3 by 4.2 by 3.6 in.)
Weight.....	110 g (3.7 oz)

### Power Requirement

Power from network module .....	1,000 mW
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### Environmental

Operating temperature .....	-40 to 60 °C
Storage temperature.....	-55 to 85 °C
Relative humidity .....	10 to 90%, noncondensing
Maximum altitude.....	2,000 m; at higher altitudes the isolation voltage ratings must be lowered
Pollution degree.....	2

## Shock and Vibration

NI recommends Compact FieldPoint if your application is subject to shock and vibration.

Operating vibration, random (IEC 60068-2-64) .....	10 to 500 Hz, 5 g <sub>rms</sub>
Operating vibration, sinusoidal (IEC 60068-2-6) .....	10 to 500 Hz, 5 g
Operating shock (IEC 60068-2-27) .....	50 g, 3 ms half sine, 18 shocks at 6 orientations; 30 g, 11 ms half sine, 18 shocks at 6 orientations

## Safety and Compliance

### Safety

This product 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 61010-1, CSA 61010-1

**Note:** For UL and other safety certifications, refer to the product label or visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

### Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

**Note:** For EMC compliance, operate this device according to product documentation.

### CE Compliance

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

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

**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/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

### Waste Electrical and Electronic Equipment (WEEE)

**EU Customers:** At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit [ni.com/environment/weee.htm](http://ni.com/environment/weee.htm).

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integrators. Services range from start-up assistance to turnkey system integration. Visit [ni.com/alliance](http://ni.com/alliance).



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We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit [ni.com/ssp](http://ni.com/ssp).

## Hardware Services

### NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with [ni.com/pxiadvisor](http://ni.com/pxiadvisor).

### Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

### Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit [ni.com/services](http://ni.com/services).



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