

# High-Speed Counter Modules for Compact FieldPoint

## NI cFP-CTR-500, NI cFP-CTR-502

- 8 inputs
  - 5 to 30 VDC inputs
  - 16-bit counter registers
  - 50 kHz, maximum
  - Gate inputs and digital outputs
  - Cascadable counters for higher counts
- 2,300 V<sub>rms</sub> bank isolation for transient overvoltage protection
- Hot-swappable with autoconfiguration
- -40 to 60 °C operating range



Module	Counter Inputs	Input Ranges	Input Type	Counter Resolution	Gate Inputs	Configurable Outputs	Internal Reference Clock for Frequency Measurements	Maximum Input Frequency
cFP-CTR-500	8	10 to 30 VDC	Sinking	16-bit, cascadable to 128-bit	4	4	1 and 32 kHz	50 kHz
cFP-CTR-502	8	5 to 30 VDC	Sourcing	16-bit, cascadable to 128-bit	4	4	1 and 32 kHz	50 kHz

## Overview

The NI cFP-CTR-50x devices are versatile, high-speed digital counter input modules for Compact FieldPoint that you can use to count digital signals ranging from 5 to 30 VDC and to measure frequency. These modules are fast enough to handle input signals up to 50 kHz for high-speed applications and flexible enough to measure frequency using the internal frequency reference or the external gate inputs. These powerful and versatile counter modules feature configurable lowpass filters to eliminate high-frequency noise and cascadable counter channels that you can use to create counters up to 128 bits wide to store trillions of counts. For discrete control applications such as packaging, you can configure the digital output channels to automatically energize external devices.

All the modules include onboard diagnostics to ensure trouble-free installation and maintenance.

## Counter Modules

The cFP-CTR-500 and cFP-CTR-502 counter modules include eight 16-bit, 50 kHz counters with dedicated clock inputs. For higher resolution counting, you can combine counter channels to provide cascaded counters of up to 128 bits. In addition, for each counter, you can set a terminal count at which the counter automatically rolls over or resets. For frequency measurement, you can configure each channel to use any one of the four gate inputs provided. In this mode, you can enable counting only when the state of the specified gate input is logic high. By sending the digital pulse

train to the gate input and using the internal reference clock of 1 or 32 kHz, you can measure the frequency of the incoming pulse train. Because you can read the state of the gate input, you can also use the four gate inputs as general-purpose digital input channels.

You can configure each of the four counter outputs to either pulse or toggle states when you reach the terminal count for a counter input. This is useful when you need to energize external equipment upon reaching a particular count for applications such as packaging. You can also use each of the outputs as general-purpose digital outputs.

The cFP-CTR-500 modules work with 10 to 30 VDC sourcing devices and provide sourcing outputs. A sourcing device connects and disconnects a voltage to and from the counter module. The cFP-CTR-500 uses a common ground plane for all the digital input channels.

The cFP-CTR-502 works with 5 to 30 VDC sinking devices and provides sinking outputs. A sinking device connects and disconnects a common terminal to and from the counter module. The cFP-CTR-502 uses a common ground plane for all the digital input channels.

All the channels on the digital input modules feature LEDs that indicate the input state of each channel.

## Isolation

cFP-CTR-50x modules feature optical bank isolation with 2,300 V<sub>rms</sub> of breakdown isolation. These Compact FieldPoint modules do not have channel-to-channel isolation.

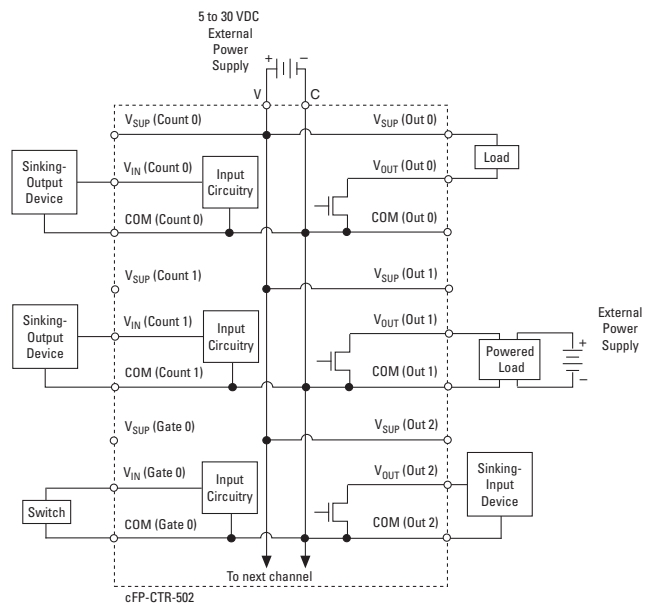
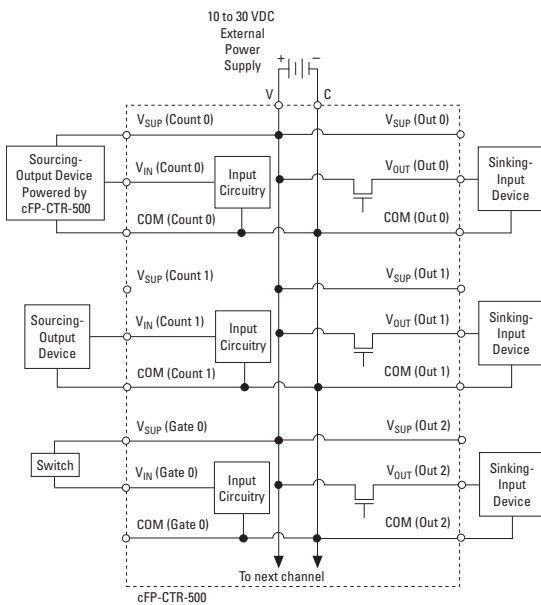
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## Field I/O Connections

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 ( $V_{SUP}$ ) and common (COM). These terminals deliver a convenient way to distribute power to field devices that require external power.

The cFP-CTR-500 and cFP-CTR-502 have:

- 8 high-speed digital counter input terminals ( $V_{IN}$ )
- 4 digital gate input terminals ( $V_{IN}$ )
- 4 digital output terminals ( $V_{OUT}$ )
- 8 common terminals (COM)
- 8 power connections to power field devices ( $V_{SUP}$ )



Wiring Schematics for Counter Modules

### Ordering Information

NI cFP-CTR-500.....	777318-500
NI cFP-CTR-502.....	777318-502

### Recommended Compact FieldPoint System Products

NI cFP-2020 .....	777317-2020
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/info](http://ni.com/info) and enter **cfpctr500** and/or **cfpctr502**.

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## Specifications

Typical for -40 to 60 °C unless otherwise noted.

### Input Characteristics

Input channels.....	12 (8 count, 4 gate)
Input type	
cFP-CTR-500.....	10 to 30 VDC, sinking
cFP-CTR-502.....	5 to 30 VDC, sourcing
Maximum input voltage.....	30 VDC
Input threshold level	
cFP-CTR-500.....	8 V typ 6 V min 10 V max
cFP-CTR-502.....	$V_{SUP} - 2.5$ V typ $V_{SUP} - 3.0$ V min $V_{SUP} - 2.0$ V max ( $V_{SUP}$ is the external supply voltage)
Input current limiting	
cFP-CTR-500.....	5 mA
cFP-CTR-502.....	6 mA
Input bandwidth	
Count inputs.....	50 kHz or software-enabled 200 kHz lowpass filter
Gate inputs .....	50 kHz
Maximum off-state leakage current for external devices	
cFP-CTR-500.....	0.2 mA
cFP-CTR-502.....	0.3 mA

### Output Characteristics

Output channels.....	4
Output type	
cFP-CTR-500.....	10 to 30 VDC sourcing, compatible with most 12 and 24 VDC devices
cFP-CTR-502.....	5 to 30 VDC sinking, compatible with TTL and other 5, 12, and 24 VDC devices
Supply voltage	
cFP-CTR-500.....	10 to 30 VDC, user-provided
cFP-CTR-502.....	5 to 30 VDC, user-provided
Maximum output current.....	1 A per channel at -40 to 50 °C; 0.75 A per channel at 50 to 60 °C
Maximum output current on all channels .....	4 A
Output impedance	
cFP-CTR-500.....	0.3 $\Omega$
cFP-CTR-502.....	0.12 $\Omega$
Output bandwidth .....	16 kHz for a current flow $\geq 3.2$ mA
Maximum off-state leakage current...	25 $\mu$ A

### Power Requirement

Power from network module .....	800 mW
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## Physical Characteristics

LED indicators	
POWER (green) .....	Power on and self-test passed
READY (green) .....	Module configured and ready
Count inputs <0..7> (green) .....	On/off state of counter input
Gate inputs <0..3> (green) .....	On/off state of gate input
Outputs <0..3> (green) .....	On/off state of output
Dimensions (including terminal base)	10.7 by 10.9 by 9.1 cm (4.2 by 4.3 by 3.6 in.)
Weight.....	100 g (3.5 oz)

### Isolation Voltage

Maximum isolation voltage .....	250 $V_{rms}$ , Installation Category II
Channel-to-channel isolation.....	No isolation between channels
Transient overvoltage.....	2,300 $V_{rms}$

### Environment

Operating temperature .....	-40 to 60 °C
Storage temperature.....	-55 to 85 °C
Relative humidity .....	10 to 90%, noncondensing

### Shock and Vibration

Operating vibration, random (IEC 60068-2-64) .....	10 to 500 Hz, 5 $g_{rms}$
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

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### 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](https://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](https://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](https://ni.com/environment/weee.htm).

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## 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).

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