ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *National Instruments FP-AI-102* at our website: ***Click HERE***

FP-AI-102 AND cFP-AI-102

Eight-Channel, High-Voltage, 12-Bit Analog Input Modules

These operating instructions describe how to install and use the FP-AI-102 and cFP-AI-102 analog input modules (referred to inclusively as the [c]FP-AI-102). For information about configuring and accessing the [c]FP-AI-102 over a network, refer to the user manual for the FieldPoint network module you are using.

Features

The [c]FP-AI-102 is a FieldPoint analog input module with the following features:

- Eight analog voltage input channels
- Six input ranges: 0–20, 0–60, 0–120, ±20, ±60, and ±120 V
- 12-bit resolution
- 2,300 V transient overvoltage protection between the inter-module communication bus and the I/O channels
- 250 V_{rms} isolation voltage rating
- –40 to 70 °C operation
- Hot plug-and-play

Installing the FP-AI-102

The FP-AI-102 mounts on a FieldPoint terminal base (FP-TB-*x*). Hot plug-and-play enables you to install the FP-AI-102 onto a powered terminal base without disturbing the operation of other modules or terminal bases. The FP-AI-102 receives operating power from the terminal base.

FieldPoint™, National Instruments™, NI™, and ni.com™ are trademarks of National Instruments Corporation. Product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your CD, or `ni.com/patents`.

323279A-01 October 2002

© 2002 National Instruments Corp. All rights reserved.

NATIONAL INSTRUMENTS™

To install the FP-AI-102, refer to Figure 1 and complete the following steps:

1. Slide the terminal base key to either position X (used for any module) or position 1 (used for the FP-AI-102 module).
2. Align the FP-AI-102 alignment slots with the guide rails on the terminal base.
3. Press firmly to seat the FP-AI-102 on the terminal base. When the module is firmly seated, the terminal base latch locks it into place.

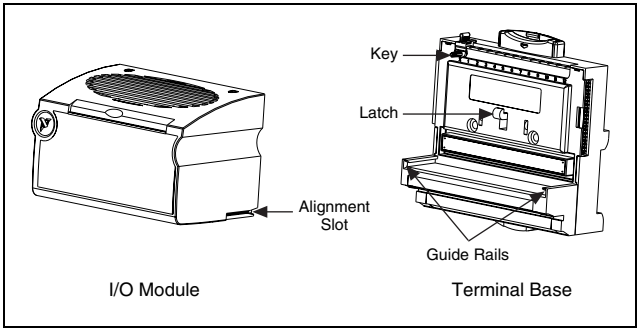


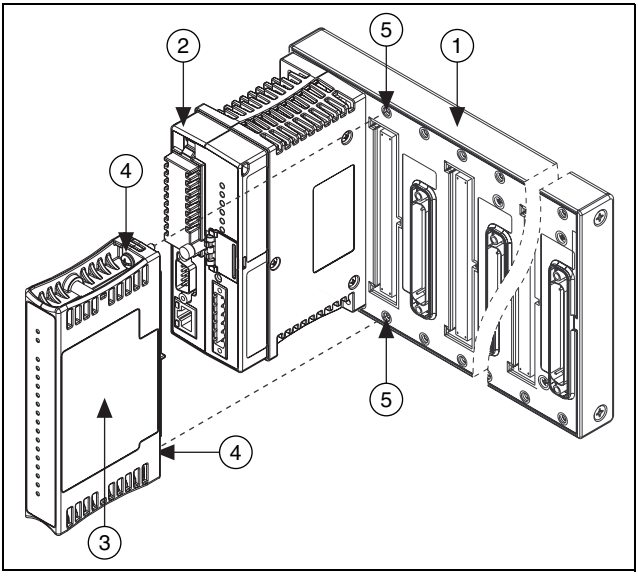
Figure 1. Installing the FP-AI-102

Installing the cFP-AI-102

The cFP-AI-102 mounts on a Compact FieldPoint backplane (cFP-BP-*x*). Hot plug-and-play enables you to install the cFP-AI-102 onto a powered backplane without disturbing the operation of other modules or connector blocks. The cFP-AI-102 receives operating power from the backplane.

To install the cFP-AI-102, refer to Figure 2 and complete the following steps:

1. Align the captive screws on the cFP-AI-102 with the holes on the backplane. The alignment keys on the cFP-AI-102 prevent backward insertion.
2. Press firmly to seat the cFP-AI-102 on the backplane.
3. Using a number 2 Phillips screwdriver with a shank of at least 64 mm (2.5 in.) length, tighten the captive screws to 1.1 N · m (10 lb · in.) of torque. The nylon coating on the screws prevents them from loosening.



1	cFP Backplane	3	cFP-AI-102	5	Screw Holes
2	cFP Controller Module	4	Captive Screws		

Figure 2. Installing the cFP-AI-102

Wiring the [c]FP-AI-102

The FP-TB-*x* terminal bases have connections for each of the eight input channels on the FP-AI-102 and for an external supply to power field devices. The cFP-CB-*x* connector blocks provide the same connections for the cFP-AI-102.

Table 1 lists the terminal assignments for the signals associated with each channel. The terminal assignments are the same for the FP-TB-*x* terminal bases and the cFP-CB-*x* connector blocks.

Table 1. Terminal Assignments

Channel	Terminal Numbers		
	V_{in}	V_{sup}	COM
0	1	17	2, 18
1	3	19	4, 20
2	5	21	6, 22
3	7	23	8, 24
4	9	25	10, 26
5	11	27	12, 28
6	13	29	14, 30
7	15	31	16, 32

Each channel has one input terminal (V_{in}) for voltage input. All eight voltage inputs share a common ground reference, the COM terminals. If you are using an external supply to power field devices, connect the power supply to the V and C terminals of the terminal base or connector block. Field devices source power from the V_{sup} and COM terminals. Refer to the following section for detailed wiring diagrams.

Caution Cascading power between two modules defeats isolation between those modules. Cascading power from the network module defeats all isolation between modules in the FieldPoint system.

Measuring Voltage with the [c]FP-AI-102

The [c]FP-AI-102 has eight single-ended input channels. All eight channels share a common ground reference that is isolated from other modules in the FieldPoint system. Figure 3 shows the analog input circuitry on one channel.

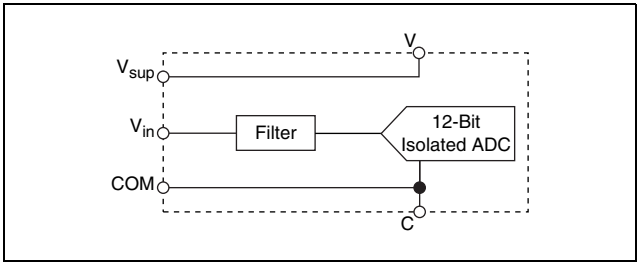


Figure 3. [c]FP-AI-102 Analog Input Circuit, One Channel

The input ranges for voltage signals are 0–20, 0–60, 0–120, ±20, ±60, and ±120 V. Connect the positive lead of a voltage source to the V_{in} terminal and the negative lead to the COM terminal. Figure 4 shows how to connect a voltage source without an external power supply to one channel of the [c]FP-AI-102.

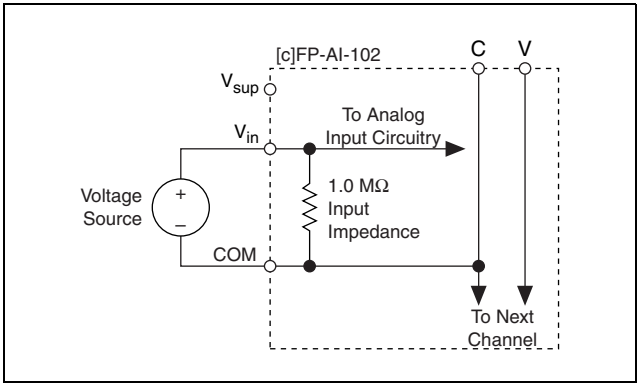


Figure 4. Voltage Source without External Power Supply

Figure 5 show how to connect a voltage source with an external power supply to one channel of the [c]FP-AI-102.

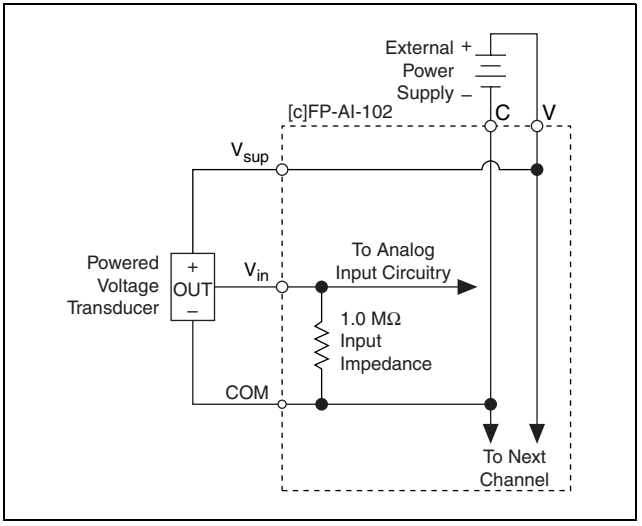


Figure 5. Voltage Source with External Power Supply

Status Indicators

The [c]FP-AI-102 has two green status LEDs, **POWER** and **READY**. After you insert the [c]FP-AI-102 into a terminal base or backplane and apply power to the connected network module, the green **POWER** indicator lights and the [c]FP-AI-102 informs the network module of its presence. When the network module recognizes the [c]FP-AI-102, it sends initial configuration information to the [c]FP-AI-102. After the [c]FP-AI-102 receives this initial information, the green **READY** indicator lights and the module is in normal operating mode.

Upgrading the FieldPoint Firmware

You may need to upgrade the FieldPoint firmware when you add new I/O modules to the FieldPoint system. For information on determining which firmware you need and how to upgrade, go to `ni.com/info` and enter `fpmatrix`.

Isolation and Safety Guidelines

Caution Read the following information before attempting to connect the [c]FP-AI-102 to any circuits that may contain hazardous voltages.

This section describes the isolation of the [c]FP-AI-102 and its compliance with international safety standards. The field wiring connections are isolated from the backplane and the inter-module communication bus. The isolation is provided by the module, which has optical and galvanic isolation barriers designed and tested to protect against transient fault voltages of up to 2,300 V_{rms}. The [c]FP-AI-102 provides *double insulation* (compliant with IEC 61010-1) for working voltages of 250 V_{rms}[1]. Safety standards (such as those published by UL and IEC) require the use of double insulation between hazardous voltages and any human-accessible parts or circuits.

Never try to use any isolation product between human-accessible parts (such as DIN rails or monitoring stations) and circuits that can be at hazardous potentials under normal conditions, unless the product is specifically designed for such an application, as is the [c]FP-AI-102.

Even though the [c]FP-AI-102 is designed to handle applications with hazardous potentials, follow these guidelines to ensure a safe total system:

- The [c]FP-AI-102 has a safety isolation barrier between the inter-module communication bus and the I/O channels. There is no isolation between channels unless otherwise noted. If any of the channels on a module are wired at a hazardous potential, make sure that all other devices or circuits connected to that module are properly insulated from human contact.
- Do *not* share the external supply voltages (the V and C terminals) with other devices (including other FieldPoint devices), unless those devices are isolated from human contact.
- For Compact FieldPoint, you *must* connect the protective earth (PE) ground terminal on the cFP-BP-*x* backplane to the system safety ground. The backplane PE ground terminal has the following symbol stamped beside it: ⏚. Connect the

[1] *Working voltage* is defined as the signal voltage plus the common-mode voltage. *Common-mode voltage* is the voltage of the module with respect to ground.

backplane PE ground terminal to the system safety ground using 14 AWG (1.6 mm) wire with a ring lug. Use the 5/16 in. panhead screw shipped with the backplane to secure the ring lug to the backplane PE ground terminal.

- As with any hazardous voltage wiring, make sure that all wiring and connections meet applicable electrical codes and commonsense practices. Mount terminal bases and backplanes in an area, position, or cabinet that prevents accidental or unauthorized access to wiring that carries hazardous voltages.
- The isolation of the [c]FP-AI-102 is certified as double-insulated for working voltages of 250 V_{rms}. Do *not* use the [c]FP-AI-102 as the only isolating barrier between human contact and working voltages of more than 250 V_{rms}.
- Operate the [c]FP-AI-102 only at or below Pollution Degree 2. Pollution Degree 2 means that only nonconductive pollution occurs in most cases. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Do *not* operate FieldPoint products in an explosive atmosphere or where there may be flammable gases or fumes. If you need to operate FieldPoint products in such an environment, the FieldPoint products *must* be in a suitably rated enclosure.
- Operate the [c]FP-AI-102 at or below Installation Category II. Installation Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level distribution, such as that provided by a standard wall outlet.

Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted. Gain error is calculated as a percentage of input.

Input Characteristics

Number of channels 8

ADC resolution ..... 12 bits

Type of ADC ..... Successive approximation

Update rate (all channels) ..... 360 Hz (2.8 ms)

Input signal ranges (software selectable by channel)

Voltage Input Range	Effective Resolution*	Typical Offset Error at 15 to 35 °C	Maximum Offset Error at –40 to 70 °C
0–20 V	15 mV	20 mV	100 mV
0–60 V	40 mV	50 mV	150 mV
0–120 V	70 mV	100 mV	250 mV
±20 V	25 mV	40 mV	175 mV
±60 V	70 mV	120 mV	350 mV
±120 V	125 mV	220 mV	700 mV

*Includes quantization errors and rms noise.

Gain error
- 15 to 35 °C ..... 0.1% typ, 0.2% max
- –40 to 70 °C ..... 0.2% typ, 0.3% max

Input impedance..... 1.0 MΩ

Input noise ..... 7 mV + 1 LSB peak-to-peak

Signal input bandwidth..... 170 Hz

Physical

Indicators ..... Green **POWER** and **READY** indicators

Weight
- FP-AI-102..... 145 g (5.1 oz)
- cFP-AI-102..... 115 g (4.0 oz)

Power Requirements

Power from network module ..... 400 mW

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}

Environmental

FieldPoint modules are intended for indoor use only. For outdoor use, they must by mounted inside a sealed enclosure.

Operating temperature ..... –40 to 70 °C

Storage temperature ..... –55 to 100 °C

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

Maximum altitude ..... 2,000 m

Pollution Degree 2

Shock and Vibration

Operating shock (IEC 68-2-27)

cFP-AI-102 ..... 50 g, 3 ms half sine, 3 shocks; 30 g, 11 ms half sine, 3 shocks

Operating vibration, random (IEC 60068-2-34)

FP-AI-102 ..... 10–500 Hz, 2.2 g_{rms}

cFP-AI-102 ..... 10–500 Hz, 5 g_{rms}

Operating vibration, sinusoidal (IEC 60068-2-6)

[c]FP-AI-102 ..... 10–500 Hz, 5 g

Safety

The [c]FP-AI-102 is designed to meet the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use.

- EN 61010-1, IEC 61010-1
- UL 3121-1
- CAN/CSA C22.2 No. 1010.1

For certifications under regulatory standards, including hazardous location standards, refer to the product label or to `ni.com`.

Electromagnetic Compatibility

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

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

Electromagnetic immunity..... Evaluated to EN 61326:
1997/A1: 1998, Table 1

Note For full EMC compliance, you must operate this device with shielded cabling. See the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, click **Declaration of Conformity** at `ni.com/hardref.nsf/`.

Mechanical Dimensions

Figure 6 shows the mechanical dimensions of the FP-AI-102 installed on a terminal base. Dimensions are given in millimeters [inches]. If you are using the cFP-AI-102, refer to the cFP controller user manual for the dimensions and cabling clearance requirements of the Compact FieldPoint system.

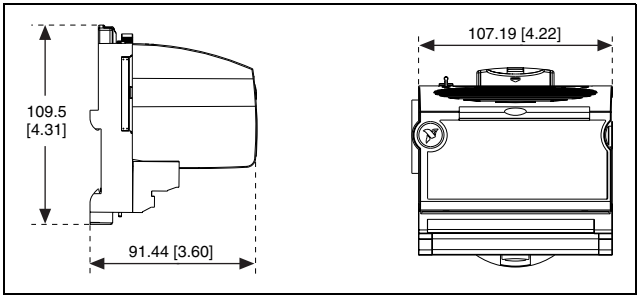


Figure 6. FP-AI-102 Mechanical Dimensions

Where to Go for Support

For more information about setting up the FieldPoint system, refer to these National Instruments documents:

- FieldPoint network module user manual
- Other FieldPoint I/O module operating instructions
- FieldPoint terminal base operating instructions

Go to `ni.com/support` for the most current manuals, examples, and troubleshooting information.

For telephone support in the United States, create your service request at `ni.com/ask` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 03 9879 5166, Austria 0662 45 79 90 0,
Belgium 02 757 00 20, Brazil 55 11 3262 3599,
Canada (Calgary) 403 274 9391,
Canada (Montreal) 514 288 5722,
Canada (Ottawa) 613 233 5949, Canada (Québec) 514 694 8521,
Canada (Toronto) 905 785 0085, China 86 21 6555 7838,
Czech Republic 02 2423 5774, Denmark 45 76 26 00,
Finland 09 725 725 11, France 01 48 14 24 24,
Germany 089 741 31 30, Greece 01 42 96 427,
Hong Kong 2645 3186, India 91 80 4190000,
Israel 03 6393737, Italy 02 413091, Japan 03 5472 2970,
Korea 02 3451 3400, Malaysia 603 9596711,
Mexico 001 800 010 0793, Netherlands 0348 433466,
New Zealand 09 914 0488, Norway 32 27 73 00,
Poland 22 3390 150, Portugal 210 311 210, Russia 095 238 7139,
Singapore 65 6 226 5886, Slovenia 3 425 4200,
South Africa 11 805 8197, Spain 91 640 0085,
Sweden 08 587 895 00, Switzerland 056 200 51 51,
Taiwan 02 2528 7227, United Kingdom 01635 523545

323279A-01 Oct02

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP