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FieldPoint Operating Instructions

FP-RLY-420

Eight-Channel SPST Relay Module

These operating instructions describe how to install and use the National Instruments FP-RLY-420 relay module, revision 185151C-01 and later. For information about installing and using earlier revisions of the FP-RLY-420, refer to document number 321904B-01. Earlier revisions of the FP-RLY-420 display the following symbol on the module label: P+ .

For information about configuring and accessing the FP-RLY-420 over a network, refer to the user manual for the FieldPoint network module you are using.

Features

The FP-RLY-420 is a FieldPoint relay output module with the following features:

- Eight single-pole single-throw (SPST) relay channels
- Switches up to 3 A at 35 VDC or 250 VAC
- –40 to 70 °C operation
- 250 V_{rms} CAT II continuous channel-to-ground isolation, verified by 2,300 V_{rms}, 5 s dielectric withstand test
- Hot swappable

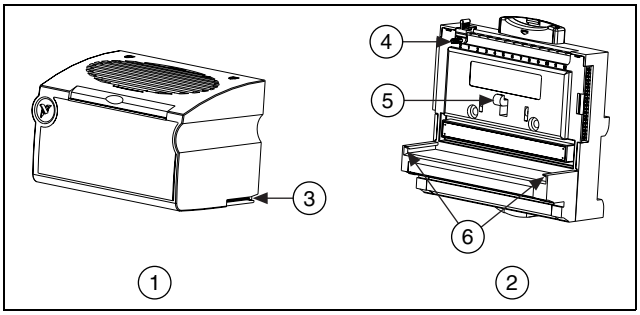
Installing the FP-RLY-420

The FP-RLY-420 mounts on a FieldPoint terminal base (FP-TB-*x*), which provides operating power to the module. Installing the FP-RLY-420 onto a powered terminal base does not disrupt the operation of the bank.

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To install the FP-RLY-420, 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-RLY-420 module.
2. Align the FP-RLY-420 alignment slots with the guide rails on the terminal base.
3. Press firmly to seat the FP-RLY-420 on the terminal base. When the module is firmly seated, the terminal base latch locks it into place.



1	I/O Module	3	Alignment Slot	5	Latch
2	Terminal Base	4	Key	6	Guide Rails

Figure 1. Installing the FP-RLY-420

Mounting the System Upright

To ensure maximum cooling efficiency, mount the FieldPoint system so that the I/O module vents are at the top as shown in Figure 2.

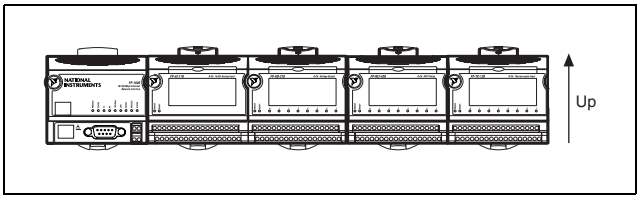


Figure 2. Mounting the System Upright

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Wiring the FP-RLY-420

The FP-TB-*x* terminal base has connections for each of the eight relay channels. Each relay channel has two terminals, NO and IC.

Caution Ensure that *hazardous voltage* wiring is performed only by qualified personnel adhering to local electrical standards. A hazardous voltage is a voltage greater than 42.4 V_{peak} or 60 VDC.

Table 1 lists the terminal assignments for the signals of each channel.

Table 1. Terminal Assignments

Channel	Terminal Numbers	
	NO	IC
0	1	2
1	3	4
2	5	6
3	7	8
4	9	10
5	11	12
6	13	14
7	15	16

All of the COM terminals are connected internally and all of the V_{SUP} terminals are connected internally. NI does not recommend using the V_{SUP} and COM terminals with the FP-RLY-420.

Table 2. V_{SUP} and COM Terminal Assignments

V_{SUP}	COM
17	18
19	20
21	22
23	24
25	26

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Table 2. V_{SUP} and COM Terminal Assignments (Continued)

V_{SUP}	COM
27	28
29	30
31	32

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 bank.

Connecting Loads to the FP-RLY-420

Wire an external power supply to the load and the IC terminal of the individual channel as shown in Figure 3. Install a 3 A, 250 V maximum, fast-acting fuse suitable for the load at the IC terminal to protect the module and the load from damage.

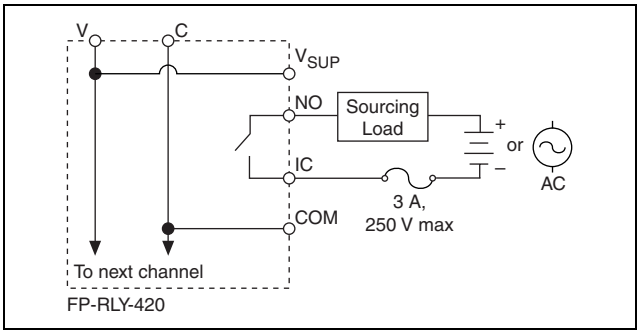


Figure 3. Connecting a Load

The FP-RLY-420 has eight SPST electromechanical relays. The power-up state is off (open) to ensure safe installation. In the ON state, the NO and IC contacts connect to form a short circuit. In the ON state, there is an effective resistance of up to 150 mΩ between the NO and IC terminals, which causes a voltage drop.[1] For example, if the current is 1.5 A, the voltage drop across the NO and IC terminals can be as high as 0.225 V.

[1] At the end of relay life, the path resistance rises rapidly above 1 Ω.

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The amount of current the relay can switch depends on the voltage, the type of load, and the ambient temperature. Refer to the *Specifications* section for more information.

Protecting Contacts for Inductive Loads

When an inductive load is connected to a relay, the energy stored in the inductive load can produce a large counter-electromotive force when the relay switches. This *flyback voltage* can severely damage the relay contacts and greatly shorten the life of the relay.

It is best to limit flyback voltages by installing a flyback diode across an inductive DC load or a metal oxide varistor (MOV) across an inductive AC load.

The FP-RLY-420 has internal protection MOVs to prevent excessively high voltage from being applied across the contacts. The MOVs are located between the NO and IC contacts of each relay. However, National Instruments recommends installing protection circuits across inductive loads. The flyback protection causes a small leakage current, which is detailed in the *Specifications* section.

Refer to the *NI Switches Help* for information about selecting and installing contact protection circuits. Go to `ni.com/manuals`, search for **switches help**, and select the current version of the *NI Switches Help*.

Status Indicators

After you install the FP-RLY-420 onto a backplane and apply power to the network module, the green **POWER** indicator lights and the FP-RLY-420 informs the network module of its presence. When the network module recognizes the FP-RLY-420, it sends initial configuration information to the cFP-RLY-420. After the FP-RLY-420 receives this initial information, the green **READY** indicator lights and the module is in normal operating mode.

In addition to the green **POWER** and **READY** indicators, each channel has a numbered, green output state indicator that lights when the channel is in the ON state.

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Isolation and Safety Guidelines

Caution Read the following information before attempting to connect the FP-RLY-420 to any circuits that may contain hazardous voltages.

This section describes the isolation of the FP-RLY-420 and its compliance with international safety standards. The field wiring connections are isolated from the backplane and the inter-module communication bus. The isolation barriers in the module provide 250 V_{rms} Measurement Category II continuous isolation, verified by 2,300 V_{rms}, 5 s dielectric withstand test. The FP-RLY-420 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 FP-RLY-420.

Even though the FP-RLY-420 is designed to handle applications with hazardous potentials, follow these guidelines to ensure a safe system:

- 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.
- Do *not* use the FP-RLY-420 as the only isolating barrier between human contact and working voltages higher than 250 V_{rms}.
- When hazardous voltages are present on any channel, all channels must be considered hazardous. Ensure that external wiring and all circuits connected to the device are properly insulated from human contact.

[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.

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- Operate the FP-RLY-420 only at or below Pollution Degree 2. Pollution Degree 2 means that only nonconductive pollution occurs in most cases. Occasionally, however, condensation can cause temporary conductivity.
- 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 FP-RLY-420 at or below Measurement Category II. Measurement Category II is for measurements performed on circuits directly connected to the low-voltage installation. This category refers to local-level distribution, such as that provided by a standard wall outlet. Do not use this module with voltages in Measurement Categories III or IV.

Using This Product Safely in Hazardous Locations

This product is suitable for use in U.S. and Canada: Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; and nonhazardous locations.

Cautions Explosion hazard—Substitution of components may impair suitability for Class I, Division 2.

Explosion hazard—Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

Equipment must be used within its electrical and environmental ratings. Refer to the *Specifications* section. Refer to the product label for manufacturing location.

This product must be installed in an enclosure rated at least IP 54.

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Specifications

The following specifications are typical for a range of –40 to 70 °C unless otherwise noted. All specifications are subject to change without notice.

Relay Characteristics

Number of channels 8

Relay type ..... SPST, nonlatching, normally open

Maximum switching capacity (resistive load)

- At 250 VAC ..... 3 A at –40 to 55 °C
  1.5 A at 55 to 70 °C
- At 35 VDC ..... 3 A at –40 to 55 °C
  1.5 A at 55 to 70 °C
- At 40 VDC ..... 2 A at –40 to 55 °C
  1.5 A at 55 to 70 °C
- At 60 VDC ..... 1 A
- At 120 VDC ..... 0.4 A

Minimum switching load ..... 10 mA at 5 VDC

Maximum switching power

- AC ..... 750 VA
- DC ..... 105 W

DC path resistance

- Initial ..... 150 mΩ
- End of life ..... ≥1 Ω

Note DC path resistance typically remains low for the life of the relay. At the end of relay life, the path resistance rises rapidly above 1 Ω. Load ratings apply to relays used within the specification before the end of relay life.

Off-state leakage

- At 250 VAC ..... 8 µA
- At 120 VDC ..... 0.12 µA

Expected life

- Mechanical ..... 2×10^7 operations min
- Electrical ..... 100,000 operations

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Maximum switching frequency

Mechanical	20 operations per second
Electrical	1 operation per second at maximum load
Relay operate time	8 ms
Relay release time	4 ms
Relay bounce time	4 ms
Contact material	Gold-plated silver cadmium oxide

Physical

Indicators	Green **POWER** and **READY** indicators, 8 green output state indicators
Weigh	164 g (5.8 oz)

Power Requirements

Power from network module	1 W max

Safety Isolation Voltage

Isolation voltage is verified by a dielectric withstand test.

Channel to backplane

Continuous	250 V_{rms}
Withstand	2,300 V_{rms}, 5 s max

Channel to ground

Continuous	250 V_{rms}
Withstand	2,300 V_{rms}, 5 s max
Channel to channel	No isolation

Environmental

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

Operating temperature[1]	–40 to 70 °C
Storage temperature	–55 to 85 °C

[1] System must be mounted upright. Refer to Figure 2 for the proper system orientation.

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Humidity	10 to 85% RH, noncondensing
Maximum altitude	2,000 m; at higher altitudes the isolation voltage ratings must be lowered
Pollution Degree	2

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
- CAN/CSA-C22.2 No. 61010-1

For UL, hazardous location, and other safety certifications, refer to the product label or visit `ni.com/certification`, 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

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/certification`, search by model number or product line, and click the appropriate link in the Certification column.

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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 and connector block operating instructions

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

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