

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-PG-522* at our website: ***Click HERE***

FP-PG-522 and cFP-PG-522

Eight-Channel Pulse Generator with 2 A, 5–30 VDC Sinking Outputs

These operating instructions describe how to install and use the National Instruments FP-PG-522 and cFP-PG-522 pulse generator modules (referred to inclusively as the [c]FP-PG-522). For details on configuring and accessing the [c]FP-PG-522 over a network, refer to the user manual for the FieldPoint network module you are using.

Features

The [c]FP-PG-522 is a FieldPoint pulse generator module with the following features:

- Eight pulse-output channels
- User-powered 2 A, 5–30 VDC sinking outputs
- 1 s, 10 ms, or 100 µs resolution setting, configurable per channel
- 16-bit on-time and off-time settings
- 100% duty cycle pulse support
- Finite and continuous pulse-generation modes
- Active/Inactive LED indicators
- 2,300 V_{rms} transient overvoltage protection
- –40 to 70 °C operation
- Hot swappable

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`.

323356B-01 May 2003

© 2002–2003 National Instruments Corp. All rights reserved.

NATIONAL INSTRUMENTS

Installing the FP-PG-522

The FP-PG-522 mounts on a FieldPoint terminal base (FP-TB-*x*), which provides operating power to the module. Installing the FP-PG-522 onto a powered terminal base does not disrupt the operation of the bank.

To install the FP-PG-522, 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 4, used for the FP-PG-522 module.
2. Align the FP-PG-522 alignment slots with the guide rails on the terminal base.
3. Press firmly to seat the FP-PG-522 on the terminal base. When the module is firmly seated, the terminal base latch locks it into place.

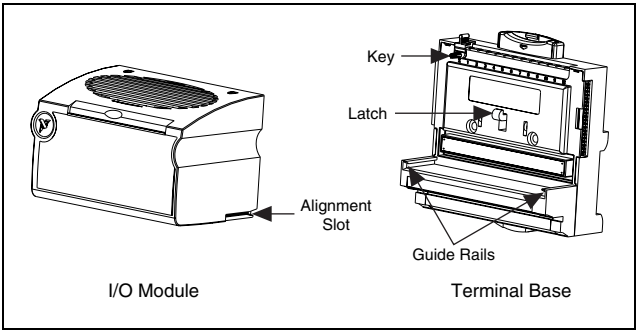


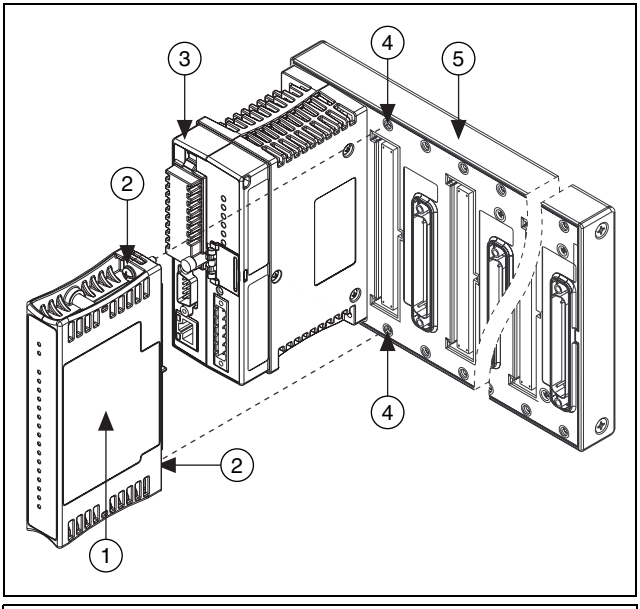
Figure 1. Installing the FP-PG-522

Installing the cFP-PG-522

The cFP-PG-522 mounts on a Compact FieldPoint backplane (cFP-BP-*x*), which provides operating power to the module. Installing the cFP-PG-522 onto a powered backplane does not disrupt the operation of the bank.

To install the cFP-PG-522, refer to Figure 2 and complete the following steps:

1. Align the captive screws on the cFP-PG-522 with the holes on the backplane. The alignment keys on the cFP-PG-522 prevent backward insertion.
2. Press firmly to seat the cFP-PG-522 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 I/O Module	4	Screw Holes
2	Captive Screws	5	cFP Backplane
3	cFP Controller Module		

Figure 2. Installing the cFP-PG-522

Wiring the [c]FP-PG-522

The FP-TB-*x* terminal base has connections for each of the eight output channels and for an external power supply to power the output channels and field devices. The cFP-CB-*x* connector block provides the same connections. Each channel has one output terminal (V_{OUT}), two supply terminals (V_{SUP}), and one common terminal (COM). All eight channels are referenced to the COM terminals. The V and V_{SUP} terminals are all internally connected, as are the C and COM terminals.

Use a 5–30 VDC external power supply for the output channels. The power supply must provide enough current to power all of the loads on the output channels, up to a maximum of 2 A per channel. Connect the external power supply to multiple V and V_{SUP} terminals and to multiple C and COM terminals as needed to ensure that the maximum current through any terminal is 2 A or less.

Install a 2 A maximum, fast-acting fuse between the external power supply and the V_{SUP} terminal on each channel. Install a 2 A maximum, fast-acting fuse suitable for the load at the V_{OUT} terminal. Figure 3 shows fuses where appropriate.

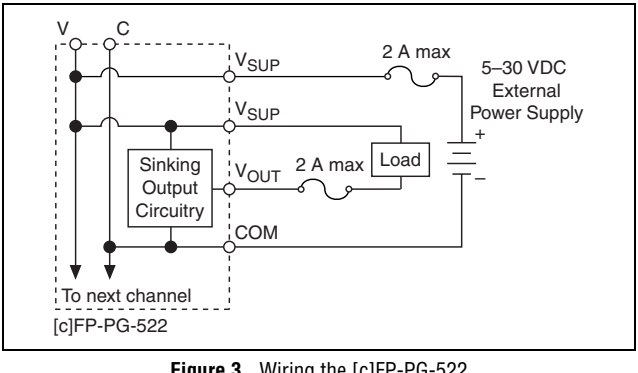


Figure 3. Wiring the [c]FP-PG-522

Caution Maximum output current for the cFP-PG-522 is temperature dependent. If the module is operating in the 60–70 °C temperature range, you must select fuses for each channel so that the sum of the squares of the output currents is lower than 8 A^2.

Table 1 lists the terminal assignments for the signals of each channel. Terminal assignments are also listed on the side panel of the cFP-PG-522 and under the slide-in card on the front of the FP-PG-522.

Table 1. Terminal Assignments

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

[1] Install a 2 A maximum, fast-acting fuse on each V_{OUT} terminal.
[2] Install a 2 A maximum, fast-acting fuse on each V_{SUP} terminal.

Pulse Output Circuit

The [c]FP-PG-522 output channels are optically isolated from the rest of the FieldPoint bank. In the ON state, a transistor is turned on between the output (V_{OUT}) and common (C and COM). In the OFF state, this transistor is turned off, allowing only a small leakage current to flow.

Ensure that the load on any channel does not draw more than 2 A. In addition, the sum of the squares of the channel currents must not exceed 16 A^2. For example, five channels operating at 1.2 A yields 7.2 A^2:

$$(1.2\ A)^2 \times 5 = 7.2\ A^2$$

Caution For a cFP-PG-522 operating in the 60–70 °C temperature range, the sum of the squares of the channel currents must not exceed 8 A^2.

Table 2 shows some common combinations of output current levels on several channels.

Table 2. Common Output Configurations

Channel Subset	Channel Subset	Total A^2
4 channels at 2 A	—	16 A^2
8 channels at 1 A	—	8 A^2
7 channels at 1.5 A	—	15.75 A^2
4 channels at 1 A	4 channels at 1.5 A	13 A^2
2 channels at 2 A	6 channels at 1 A	14 A^2

In the ON state, the effective resistance between V_{OUT} and COM is 0.12 Ω, which causes a voltage drop. For example, if the output current is 1 A, the voltage drop is 0.12 V:

$$(1\ A \times 0.12\ \Omega) = 0.12\ V$$

Configuring the Count-Input Channels

The [c]FP-PG-522 generates pulses consisting of a specified on time followed by a specified off time. In FieldPoint software, you can configure each count-input channel to operate with different attributes. In the Channel Configuration dialog box, select attributes for each channel from the **Attributes** menu. The following sections describe the different attributes you can select when you are configuring count-input channels. The [c]FP-PG-522 does not support synchronization between channels. For more information about configuring channels in FieldPoint software, refer to the online help.

Pulse Mode

The Pulse Mode attribute for a channel can be either Finite or Continuous. In Finite mode, a channel responds to commands that start a finite pulse train of a specified number of pulses or stop generation of a currently running pulse train. These commands are discussed in the *Channel Commands* section. In Continuous mode, a channel continuously generates pulses and does not respond to any commands.

A channel set to Continuous mode must be switched to Finite mode in order to stop pulse generation. When switched to Finite mode from Continuous mode, a channel finishes generating the current pulse and then stops.

On Time

The On Time attribute for a channel controls the duration of the pulses the channel generates. On Time can be any integer from 1 to 65,535. Configure the Resolution attribute for the channel to set the units for On Time and Off Time.

Off Time

The Off Time attribute for a channel controls the amount of time between pulses. Off Time can be any integer from 0 to 65,535. The Resolution attribute for the channel determines the units for Off Time and On Time.

Resolution

The Resolution attribute determines the units for On Time and Off Time. Possible Resolution values are 1 s, 10 ms, and 100 µs.

The multiple Resolution settings enable you to generate short, high-precision pulses on some channels and long pulses on others.

Changing Settings During Pulse Generation

If a channel is actively generating pulses in either Continuous or Finite mode, changes to On Time, Off Time, and Resolution settings take effect after the current pulse is finished.

Calculating On Time and Off Time

Table 3 lists the maximum On Time or Off Time for each Resolution setting. In general, you should select the smallest Resolution that allows the [c]FP-PG-522 to generate the necessary pulses.

Table 3. On Time and Off Time Maximum Values

Resolution	Max On or Off Time	Divide By
100 µs	6.5535 s	0.0001
10 ms	655.35 s	0.01
1 s	65,535 s	1

To calculate On Time and Off Time, divide the desired On or Off Time for the pulse by the Resolution. For example, to generate a pulse that is on for 3.5 s and off for 0.25 s using a 100 µs Resolution, set the On Time to 35,000 and the Off Time to 2,500 (100 µs = 0.0001 s; On Time = 3.5/0.0001 = 35,000; Off Time = 0.25/0.0001 = 2,500).

Channel Commands

Two commands can control operation of the [c]FP-PG-522 output channels. These commands affect only a channel operating in Finite Pulse mode. Commands sent to a channel operating in Continuous Pulse mode have no effect.

The Control command supports two actions: Stop Immediately and Stop After Current Pulse. Both of these actions can stop a finite pulse train. Stop Immediately stops pulse generation immediately. The channel goes into the idle state, and, if the output for the target channel is on, it is turned off. Stop After Current Pulse ends the current pulse train after the current pulse is finished.

The Generate Pulses command generates a pulse train consisting of the number of pulses indicated by the command value. The value of the Generate Pulses command can be any integer from 1 to 65,535. If a finite pulse train is already being generated when the Generate Pulses command is sent, the new pulse train begins after the current pulse and supersedes the current pulse train.

If actively generating a finite pulse train, the [c]FP-PG-522 can store one pending command for each channel. The Control: Stop Immediately action takes effect as soon as the command is received. The Control: Stop After Current Pulse action and the Generate Pulses command are deferred until the end of the current pulse if a pulse train is being generated. When a command is pending and a second command is received, the pending command is discarded and the new command is executed instead.

Channel Data

The [c]FP-PG-522 has eight physical channels that you can use to generate pulses. Each of these physical channels has two software channels associated with it, so the FieldPoint software shows 16 channels. The first eight channels, 0–7, are the “main” channels. These are the channels that you configure with your desired pulse settings and that you send commands to in order to use the module. The data for channels 0–7 are unsigned count

values, which reflect the number of pulses each channel has left to generate after the current pulse. When you send the Generate Pulses command to one of these channels, the data immediately changes to reflect the number of pulses that remain. The data value starts at the total number of pulses minus 1 and is zero during the last pulse. For channels generating pulses in Continuous mode, the data value is always zero.

Channels 8–15 correspond to physical channels 0–7. These channels are not associated with any configuration attributes or commands. The data values for channels 8–15 are Boolean values that reflect the state of the physical outputs. Table 4 shows the relationship between physical channels and the channels seen from the FieldPoint software.

Table 4. Relationship of Physical and Software Channels

Physical Channel	Pulse Channel	Output State Channel
0	0	8
1	1	9
2	2	10
3	3	11
4	4	12
5	5	13
6	6	14
7	7	15

Status Indicators

Figure 4 shows the status indicator LEDs on the [c]FP-PG-522.

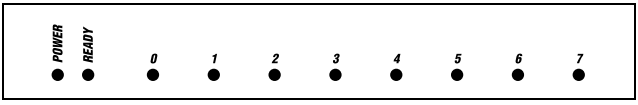


Figure 4. Status Indicators

The [c]FP-PG-522 has two green status LEDs, **POWER** and **READY**. After you insert the FP-PG-522 into a terminal base or the cFP-PG-522 onto a backplane and apply power to the connected network module, the green **POWER** indicator lights and the [c]FP-PG-522 informs the network module of its presence.

When the network module recognizes the [c]FP-PG-522, it sends initial configuration information to the [c]FP-PG-522. After the [c]FP-PG-522 receives this initial information, the green **READY** indicator lights and the [c]FP-PG-522 is in normal operating mode.

In addition to the green **POWER** and **READY** indicators, each channel has a numbered, green activity indicator that lights when the channel is actively generating pulses. The LED does not indicate whether the channel is currently in the ON or the OFF state.

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 the firmware, go to `ni.com/info` and enter `fpmatrix`.

Isolation and Safety Guidelines



Caution Read the following information before attempting to connect the [c]FP-PG-522 to any circuits that may contain hazardous voltages.

This section describes the isolation of the [c]FP-PG-522 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}.

Follow these guidelines to ensure a safe total system:

- The [c]FP-PG-522 has a safety isolation barrier between the I/O channels and the inter-module communication bus. 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 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.
- Operate the [c]FP-PG-522 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.
- Refer to the FieldPoint product label for regulatory certification under hazardous location standards. If the FieldPoint product is not certified for operation in hazardous locations, do not operate it in an explosive atmosphere or where there may be flammable gases or fumes.

Specifications

The following specifications are typical for a range of –40 to 70 °C unless otherwise noted.

Output

Number of channels 8

Output type ..... 5–30 VDC, sinking

Supply voltage ..... 5–30 VDC, user-provided

Maximum output current

- Per channel ..... 2 A per channel
- Across all channels ..... 16 A^2 (8 A^2 for cFP-PG-522 operating at 60–70 °C)

Output impedance ..... 0.12 Ω

Pulse-width accuracy ..... ±5 µs, any pulse settings

Pulse-frequency accuracy ..... 0.007%, any pulse settings

Physical Characteristics

Indicators ..... Green **POWER** and **READY** indicators, eight green output state indicators

Weight

FP-PG-522..... 130 g (4.6 oz)

cFP-PG-522..... 100 g (3.5 oz)

Power Requirements

Power from network module ..... 600 mW

Isolation Voltage

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 be mounted inside a sealed enclosure.

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

Storage temperature ..... –55 to 85 °C

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

Maximum altitude..... 2,000 m; at higher altitudes the isolation voltage ratings must be lowered

Pollution Degree 2

Shock and Vibration

These specifications apply only to the cFP-PG-522. NI recommends Compact FieldPoint if your application is subject to shock and vibration.

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

Operating vibration, sinusoidal (IEC 60068-2-6)..... 10–500 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

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

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

Electromagnetic Compatibility

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

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

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

Note For EMC compliance, you *must* 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, click **Declarations of Conformity Information** at `ni.com/hardref.nsf/`.

Mechanical Dimensions

Figure 5 shows the mechanical dimensions of the FP-PG-522 installed on a terminal base. If you are using the cFP-PG-522, refer to your Compact FieldPoint controller user manual for the dimensions and cabling clearance requirements of the Compact FieldPoint system.

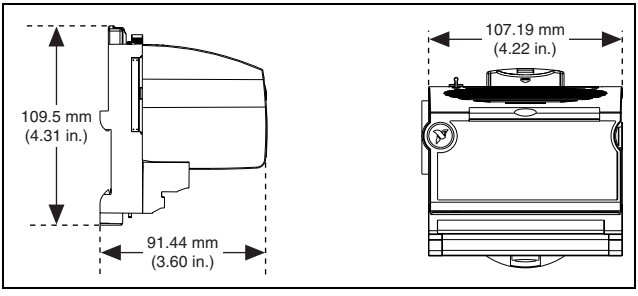


Figure 5. FP-PG-522 Mechanical Dimensions

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 and connector block 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 1800 300 800, Austria 43 0 662 45 79 90 0,
Belgium 32 0 2 757 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,
Canada (Vancouver) 514 685 7530, China 86 21 6555 7838,

Czech Republic 420 2 2423 5774, Denmark 45 45 76 26 00,
Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,
Germany 49 0 89 741 31 30, Greece 30 2 10 42 96 427,
India 91 80 51190000, Israel 972 0 3 6393737,
Italy 39 02 413091, Japan 81 3 5472 2970,
Korea 82 02 3451 3400, Malaysia 603 9131 0918,
Mexico 001 800 010 0793, Netherlands 31 0 348 433 466,
New Zealand 1800 300 800, Norway 47 0 66 90 76 60,
Poland 48 0 22 3390 150, Portugal 351 210 311 210,
Russia 7 095 238 7139, Singapore 65 6226 5886,
Slovenia 386 3 425 4200, South Africa 27 0 11 805 8197,
Spain 34 91 640 0085, Sweden 46 0 8 587 895 00,
Switzerland 41 56 200 51 51, Taiwan 886 2 2528 7227,
Thailand 662 992 7519, United Kingdom 44 0 1635 523545

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