

PFI-9608 C Series™

8-Channel Programmable Filter Analog I/O Module



- High-performance analog input/output modules for use in any National Instruments™ CompactDAQ™ or CompactRIO™ chassis
- Provides protection against aliasing in front of NI™ C-Series analog to digital converters
- 8 channels per module
- Balanced differential input
- Programmable FLAT/PULSE 4-Pole Low-Pass Filter; up to 30 kHz Bandwidth
- Test Bus for System Calibration Signal Injection
- -40 to 70°C operating range



Description

Precision Filters' model PFI-9608 module provides eight channels of high-performance programmable low-pass filter amplifiers for use in either CompactDAQ or CompactRIO systems. The module outputs may be connected to a suitable National Instruments C-Series analog input module to form a complete alias protected signal measurement system. The 9608 features Precision Filters FLAT/PULSE low-pass filter technology, allowing the frequency response to be programmed for either spectrum analysis applications or for time domain analysis such as shock. The module is fully compatible with National Instruments C Series hardware family that features more than 50 measurement modules and several sizes of chassis and carriers for deployment.

Each channel is equipped with a fully programmable 4-pole, 4-zero low-pass filter with unity gain. The low-pass filters may operate either in a "flat" mode for maximally flat pass-band amplitude response with sharp roll-off or in a "pulse" mode for low phase distortion and optimized transient response. The "flat" mode provides passband characteristics nearly identical to a Butterworth filter while providing a much sharper roll-off. This mode is a good choice for applications such as spectral analysis. The "pulse" mode has time domain response similar to the Bessel filter yet provides superior amplitude response characteristics. The "pulse" mode is ideal for time domain applications including transient (shock) measurements and waveform analysis.

The filter cutoff frequency may be independently programmed on each channel to one of five frequencies. Two frequency ranges are available. Range FX00 provides cutoff frequencies of 10, 30, 100, 300 and 1000 Hz. Range FX02 has cutoffs of 300, 1,000, 3,000, 10,000 and 30,000 Hz.

The PFI-9608 differential input amplifier provides excellent rejection to common mode signals. The module ground/isolate switch allows the user to refer the module isolated ground to chassis ground or to a customer supplied ground reference that can be up to 60V from the chassis ground.

The low-pass filters may be used to improve measurement signal to noise ratio and are required for aliasing protection in front of sampling analog to digital converters. The sharp, selective response of the filters allows for lower sampling rates for required alias protection. Outstanding channel-to-channel phase and amplitude match makes the PFI-9608 ideal for applications where time coherence between channels must be maintained.

Specifications

Input Characteristics:

Type: Balanced DC coupled differential input

Input Impedance: 10 MΩ || 100 pF per side

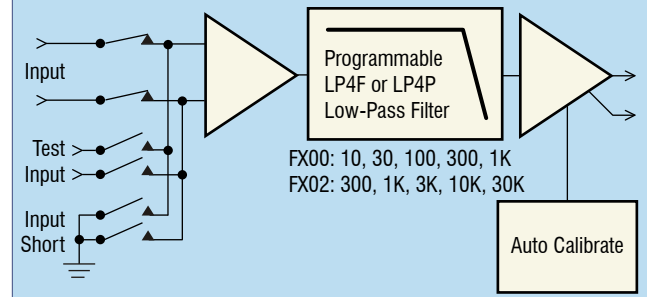
Max Level (AC + DC + Common Mode): ±5 Vpk for $f \leq 50$ kHz; ± 5 Vpk x (50 kHz/f) for $f > 50$ kHz

Protection: 15 V continuous, 50 Vpk for 1mS, 10% duty cycle

CMRR: 80 dB, DC to 1 kHz

MUTE Mode: terminate unused channels or channels with faulty sensors in quietest state.

PFI-9608 Channel Block Diagram



Applications

- Anti-aliasing filters for NI 9201, 9205, 9215, 9220, 9221 and 9222 C-Series modules
- Modal analysis and vibration
- Acoustics
- Reconstruction filters
- Automatic Test Equipment
- Industrial Process Control

Specifications (Continued)

Amplifier:

DC Gain: $\times 1 \pm 0.05\%$

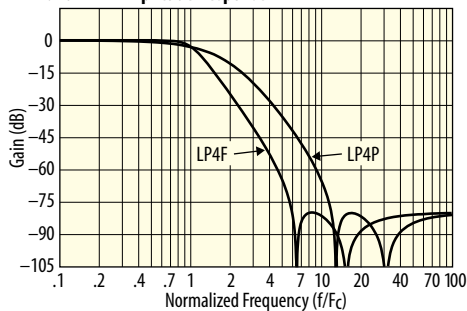
Temperature Coefficient: $\pm 0.001\% / ^\circ\text{C}$

DC Linearity: 0.005% re: Full-scale, relative to best straight line

Analog Filter:

Type: Programmable (FLAT/PULSE) LP4FP 4-pole, 4-zero low-pass filter. Programmable for maximally flat pass-band (LP4F) or linear phase with optimized pulse response (LP4P) Refer to the LP4FP filter characteristic spec sheet for more information.

LP4F and LP4P Amplitude Response



Programmable Cutoff Frequencies:

FX00 Range: 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1000 Hz

FX02 Range: 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz

Pass-Band Accuracy:

± 0.1 dB, DC to F -0.1 dB

± 0.15 dB to F -0.5 dB

Phase Match:

0.1° typical, 1° max, DC to F -0.1 dB;

0.15° typical, 1.5° max to F -0.5 dB

Amplitude Match:

0.01 dB typical, 0.1 dB max, DC to F -0.1 dB;

0.015 dB typical, 0.15 dB max to F -0.5 dB

Test Modes:

Amplifier Short: A switch at the amplifier input is utilized to ground the input stage for measurement of self-noise and DC offset.

Test Bus: A switch at the channel input allows for automated injection of an external calibration signal via front panel 37-pin connector. The test bus signal can be daisy chained across multiple modules.

Output:

Type: Fully buffered, DC coupled single-ended

Impedance: $10 \Omega // 10$ pF

Max Output: ± 5 Vpk

Min Load Impedance: 10 k Ω

DC Offset: < 5 mV at 25°C

Offset Drift: $80 \mu\text{V}/^\circ\text{C}$

Crosstalk: -80 dB, DC to 10 kHz

Noise: $150 \mu\text{Vrms}$ RTO in 100 kHz BW

Programming:

There are two methods of controlling the settings of the PFI-9608.

A) PFI supplied LabView™ Driver VI to control the module from a LabView project.

B) Alternately, stand-alone turnkey C-Series signal conditioning systems supplied by Precision Filters can be controlled using PFI executable GUI requiring no software programming.

Any desired power-on state may be saved to non-volatile memory enabling deployment in C-Series chassis without a need for a host computer.

Power: 800 mW at 25°C

Isolation:

60 V DC or AC continuous Bank isolation, channel to earth ground

Physical:

NI C-Series Compatible

Connector: 37-pin D Sub

Weight: 6 oz.

Accessories

CONN-IN-37D: Mating Input Connector with metal backshell and crimp contacts

CONN-IN-37D-SC: Mating Input Connector with metal backshell and solder cup contacts

NI 9923: Front Mount Screw Terminal Block for 37-Pin D-SUB Modules (available from National Instruments)

Certifications

CE, ATEX European Union Hazardous Locations, ROHS

Safety Standards: EN 61010-1

EMC Standards: EN 61326-1

Hazardous Location Standards: EN 60079-0 & EN 60079-15

Ordering Information

PFI-9608-FX??

?? = 00 for prog. Fc's of 10, 30, 100, 300 and 1000 Hz.

?? = 02 for prog. Fc's of 300, 1 kHz, 3 kHz, 10 kHz and 30 kHz

8-Channel Filter Module

