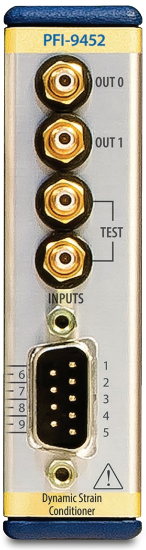
PFI-9452 C Series Module

Analog Input/Output Module for Dynamic Strain Measurements

PRECISION FILTERS, INC.

- **High-performance analog input/output modules for use in any National Instruments™ CompactDAQ™ or CompactRIO™ chassis**
- **2 channels per module**
- **Programmable Balanced Constant Current (BCC) Optimized for Dynamic Strain Measurements**
- **Programmable Gain**
- **100 kHz Bandwidth**
- **Sensor Health Monitoring**
- **–40 to 70°C operating range**



Description

Precision Filters, Inc. model PFI-9452 C Series module provides two channels of dynamic strain measurement capability. The module outputs may be connected to a suitable cDAQ™ or cRIO™analog input module for a complete dynamic strain measurement system. The module features Precision Filters' Balanced Constant Current™ (BCC™) technology that is optimized for making dynamic strain measurements. The module is fully compatible with National Instruments CompactDAQ or CompactRIO C Series hardware family that features more than 50 measurement modules and several sizes of chassis and carriers for deployment.

The measurement of dynamic strain using a single active strain gage is commonly performed using a Wheatstone bridge. The Wheatstone bridge topology can be problematic for measurements using long cable runs because the cable resistance will cause potentially large measurement errors. The circuit is also highly susceptible to electrostatic noise pickup. In high temperature environments, cable resistance uncertainty precludes the use of the Wheatstone bridge circuit.

Precision Filters developed and perfected BCC for measuring dynamic strain. The technique is insensitive to cable resistance, provides a balanced connection to the strain gage for reduced electrostatic noise pickup and requires only two wires to connect to the strain gage. Balanced Constant Current is widely used for making dynamic strain measurements on rotating machinery. It is also used for shock and vibration measurements using shaker tables, wind tunnels, vehicle and aircraft survivability and many other applications that require the measurement of dynamic strain.

Specifications

Excitation:

Excitation Type:
2-Wire Balanced Constant Current

Excitation:
Programmable from 0 mA to ±10 mA with 100 µA steps

Input Compliance (linear range): 14.5-(I*700) Volts, typical

Impedance: 100 kΩ per side

Accuracy: ±0.1% of setting, ±10 µA; Excitation ≥1 mA

Drift: 30 nA + 0.0024% of setting per °C

Noise: 100 pA per root Hz at 1 kHz

Input Characteristics:

Type: Balanced AC-coupled differential

AC Coupling Frequency: 0.25 Hz (–3.01 dB)

Max Level (AC + DC):
±0.5 Vpk for f ≤50 kHz; ±0.5 Vpk x (50 kHz/f) for f >50 kHz

Common Mode Level: 5 V, maximum

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

–0.1dB Bandwidth: 7 Hz to 50 kHz

CMRR: 80 dB, 50 Hz to 1 kHz; 60 dB 1 kHz to 10 kHz.

MUTE Mode:
Gage Mute mode program excitation to zero and ground channel input

Amplifier:

Gain: x10, 30, 100, 300, Programmable

Accuracy: 0.1% at 1 kHz

Analog Filter:

Low-Pass Filter:
Three-Pole Butterworth (60 dB/Decade), –3.01 dB at 100 kHz

Conformance to Theoretical Response:
± 0.1 dB, 10 Hz to 50 kHz,
± 0.2 dB, 50 kHz to 100 kHz

Output:

Type: AC coupled single-ended

Impedance: 10 Ω // 10 pF

Level: ±5 Vpk, ±5 mApk

Crosstalk: –80 dB DC to 50 kHz

Noise: 6 µVrms RTI + 80 µVrms RTO, 50 kHz BW

Specification (Continued)

Test:

Testmodes:
RUN, TESTBUS, SHORT, AC Current, EXC Off

Sensor Verification:

Loop Current – Monitors and reports the actual transducer excitation current delivered to the gauge.

Compliance Headroom – Alerts the user to a condition where the DC bias voltage on the input terminals exceeds specifications.

Loop Resistance – Monitors and reports the total resistance of the strain gage and interconnecting cable.

Open & Short – Reports a transducer open or short condition per user-defined limits.

Leakage Resistance – Reports the transducer and cable leakage resistance to ground.

AC Current – An AC current square wave, 50% duty cycle at the programmed frequency is injected into the current loop to evaluate end-to-end system frequency response. The AC current level is 0.1% of programmed excitation current.

Frequency:

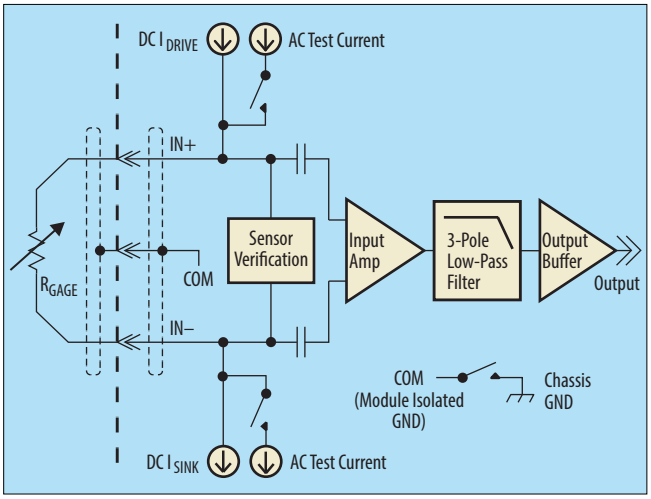
1 kHz to 100 kHz in 1 kHz steps

Frequency Accuracy: ± 5%

Programming:

There are two methods of controlling the settings of the PFI-9452.

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



PFI-9452 Channel Block Diagram

B) Alternately, stand-alone turnkey signal conditioning systems supplied by Precision Filters can be controlled using PFI executable GUI requiring no software programming. Stand-alone system requires use of NI 9147 4-slot or 9149 8-slot chassis.

Power: 950 mW max

Isolation:

±60 V module isolated GND (COM) to chassis GND.

COM maybe connected to chassis via a manual switch accessible through module cover.

Physical:

NI™ C Series Compatible

Input Connector: 9-pin D Sub

Output Connector: 2 ea. SMB Jack

Test Bus Connector: 2 ea. SMB Jack

Weight: 6 oz.

Certifications:

CE, RoHS, Ex European Union Hazardous Locations

Safety Standards:
EN 61010-1

EMC Standards:
EN 61326-1

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

Accessories:

Mating Input Connector:
CONN-IN-9D Mating Input Connector with metal backshell and crimp contacts

CONN-IN-9D-SC Mating Input Connector with metal backshell and solder cup contacts

CONN-IN-9D-SCT Mating Input Connector with metal backshell and screw terminal connections

Module Output Cables:
CB-SMB/BNCM-L: SMB plug to BNC male cable; L = 0.5, 1, 3, 10 feet

CB-SMB/PIGTAIL-L: SMB plug to prepped/ tinned leads for NI screw terminal connections; L = 0.5, 1, 3, 10 feet

CB-16XSMB/DC37S-L: 16 SMB plug to DC37 sockets for connection to NI 9220; L = 1, 3 feet

CB-SMB/SMB-L: SMB plug to SMB plug cable for bussing test input; L = 0.5, 1 feet

P8482 Rev. E

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