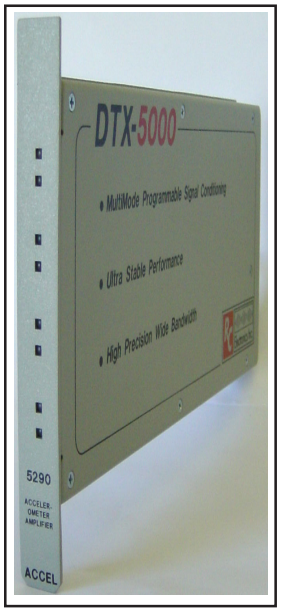
6290

Four Channel Extended Range ICP Conditioner

Description

The 6290 is a four-channel signal conditioner for ICP or other types of transducers requiring constant current excitation. Multiple input stages are used to optimize performance across an extended Gain-Bandwidth beyond the range of simplier designs. A programmable constant-current source provides power to the input sensor, and the return signal (which appears as a varying voltage on the same line) is amplified and processed into a ±10v output signal. Each channel is configured as an AC-coupled amplifier with programmable gain capable of converting sensor signals as low as 5mV (peak) into a ±10v output voltage.



6290 Four Channel Extended Range ICP Conditioner

Features

- **Extend Wideband Response**
  Gain Range: 1 to 2000
  0.02 Hz to 400 kHz
- **Constant Current Source**
  Programmable: 2 to 20 mA
  Compliance Voltage: 24v
- **Ultra-stable Low Noise Amps**
  Output Noise: 1 mV rms
  Stability: 50 ppm/°C
- **Programmable Output Filter**
- **LED Status Indicators**
- **Compact Rugged Enclosure**

Design Features

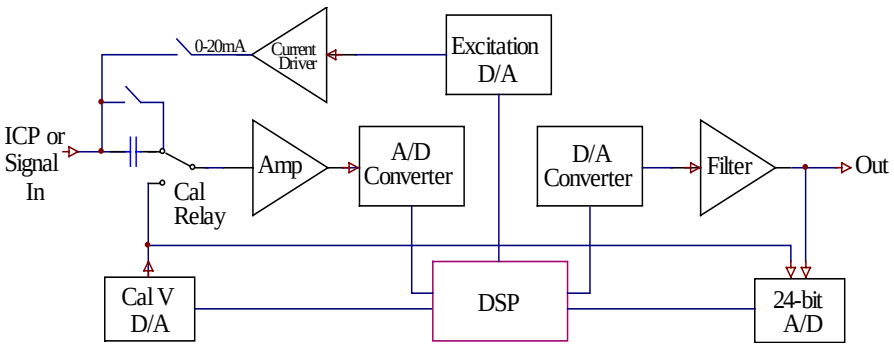
The 6290 provides a programmable gain range of 1 to 2000 with a full 400 kHz bandwidth. A programmable constant-current source provides excitation power to sensors with internal integrated amplifiers, and a programmable calibration voltage source is available for establishing baseline values before and after a test is run. Front-panel LEDs indicate signal presence and warn of overload conditions and module operational problems. Stable low temperature-coefficient components are used to maintain system accuracy over a wide temperature range, and all circuitry is housed in a shielded enclosure for improved reliability and noise reduction.

Input Stage

The input signal is first AC-coupled to block the DC excitation current, and then is fed to one of two front end amplifier stages. For gains of 1 to 200, a unity gain input buffer is used. For gains from 10 to 2000, a x10 low noise pre-amp may be switched in prior to a variable-gain amplifier used to boost the signal to a level suitable for A/D conversion. Using this approach ensures high common-mode rejection to reduce noise pickup on the sensor wires, and avoids the use of switched gain resistors in the most noise and temperature sensitive portion of the circuit.

DSP - Programmable Gain

The variable gain amplifier is controlled by an onboard DSP prior to digitization and subsequent processing. A 16 bit high speed Sigma-Delta converter is then used to convert the amplifier input to a digitized signal for subsequent processing. The Digital Signal Processor then uses stored offset and gain calibration factors to correct the digitized data values and generate an error corrected digitally filtered output. The result is an amplified, error-corrected, and digitally-filtered output that is ready to be converted back to an analog output voltage.



6290 Technical Diagram

Signal Conditioning 6000

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Output Circuit

The processed digital output is converted back to an analog voltage by a high-speed 16-bit Digital-to-Analog Converter. A four-pole low-pass filter/buffer-amp removes the digitizing steps in the reconstructed signal, along with any high-frequency noise. As with the input circuit, temperature-stable components are used to ensure that system calibration holds over a wide temperature range.

Signal and Status Monitor LEDs

Front-panel LED's are used to monitor both the signal level and the operating status of each channel. The DSP compares each digital sample to the level set by the user, and adjusts the intensity and color of the Signal LED accordingly. The DSP also monitors the excitation current level and overall digital operation, and sets the color and flash-rate of the Status LED as needed to warn the user of a problem.

Programmable Excitation Current

A programmable constant-current source provides excitation power for the sensor. A Digital-to-Analog Converter creates a programmable control voltage that is used to control the output of current regulator. The current being drawn is sensed and used as a feedback signal to keep the current constant. Each circuit can provide up to 20 mA of excitation current with a maximum output voltage of 24v.

System Calibration

High accuracy is obtained during the conversion process by implementing a unique end-to-end calibration scheme within the 6290 Converter. A precision programmable voltage generator is connected to the input, and two calibration voltages (0v and 80% of full-scale) are fed in, amplified by the input stage, converted by the A/D, processed by the DSP, converted back to analog by the D/A, filtered by the output filter, and then measured by a high-accuracy 24-bit A/D converter. The input and output voltages are compared, and gain and offset correction values are computed and saved in the DSP memory. When data is being collected, these correction factors are applied to each data point in real time, resulting in a system accuracy of ±0.05% of full-scale.

Specifications

General	
Gain Range	1 to 2000, programmable
Frequency response	0.02Hz to 400kHz
Gain accuracy	±0.05%
Linearity	±0.01%
Stability	50 ppm/°C
Input noise	10uV rms
Input Protection	250V max.
AC coupling	0.2 Hz, 0.02 Hz
Output Noise	1 mV rms
Output voltage range	±10v@50 mA
Output impedance	50 ohms
Short Circuit Protected	Yes

Low Pass Filter	
Type	Digital, programmable
Range	1 Hz to 100 kHz
Roll-off	96 dB/octave, programmable

Overload Indicator	
Type	Front-panel LED
Trip Level	0.1V to 10V, programmable

Calibration Source	
Type	Internal voltage reference
Voltage range	0 to 2.5v, programmable
Accuracy	0.01%
Stability	10 ppm /°C

Excitation	
Type	Constant current
Range	1 to 20 mA, programmable
Accuracy	0.5%
Compliance voltage	24v
Stability	10 ppm /°C

Environmental:	
Operating	0 to 50 °C
Storage temp	-25 to 85 °C
Humidity	0 to 90% non condensing

Physical Characteristics	
Package	Shielded, 6 sides
Dimensions	0.8" x 4.2" x 9.5"
Weight	1.3 lbs

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