

The 6031 is a two-channel, fully programmable signal conditioning amplifier, filter and digitizer. It features a plug-on signal conditioning completion card that is available for strain gage, bridge, RTD, potentiometer, voltage-mode charge, voltage and current transducers. Each channel has a programmable gain differential instrumentation amplifier, four 8-pole low-pass filters, a 16-bit digitized output and a  $\pm 10$  Volt analog output that can be selected for wideband or filtered response.

The signal conditioning in the 6031 is built around a completion card that configures it for various types of transducers. Programmable excitation provides either 0 to 10.24 Volts constant voltage with remote sensing or 0 to 50 mA constant current excitation for strain gages, bridges, RTDs, potentiometers and other transducers requiring a highly stable source of DC power. A DC supply provides up to 25 Volts of regulated DC power and doubles as the power source for current loops and integrated electronic piezoelectric (IEPE) transducers.

The bridge input is eight-wire shielded; input (2), excitation (2), sense (2) and shunt calibration (2). Automatic bridge balancing ahead of the instrumentation amplifier accommodates large unbalances without limiting gain or dynamic range. The high-impedance current source used for balancing will not cause linearity errors due to bridge loading effects.

The 6031 employs an amplifier/digitizer-per-channel architecture, which provides high bandwidth and digitizing speed with excellent channel-to-channel time correlation. It offers the highest accuracy and completely eliminates crosstalk between channels. Using Pacific's PI660 software zero and gain calibration and correction are automatic.

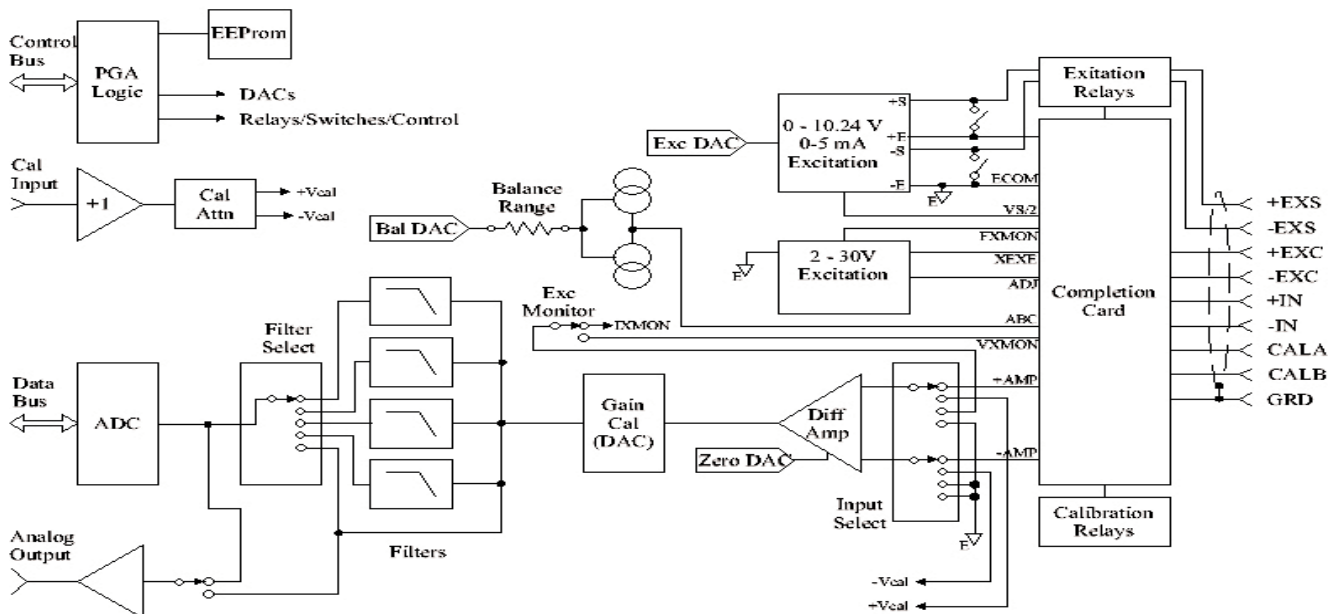
The differential instrumentation amplifier has continuous programmable gains from 1 to 5,000 with automatic zero and high common mode rejection. The standard filter is an eight-pole Bessel with four programmable bandwidths and wideband. An optional four-pole Bessel filter has continuously programmable bandwidth with resolution of 1 Hz from 4 Hz to 1 kHz and 5 Hz from 1 kHz to 20 kHz.



**FEATURES**

- Voltage & current excitation including remote sense
- Plug-in channel configuration and calibration card
- Gains 1 to 5,000 with 0.05% resolution
- 50 kHz or 100 kHz bandwidth
- Automatic zero and balance
- Programmable low pass filters
- Voltage substitution gain calibration
- Digitized and analog outputs
- 100K or 250K Samples per second with 16-bit resolution

The 6031 with the 6031-CC6 completion card provides two-step, bipolar, resistive shunt calibration that may be applied to internal or external bridge arms. Other completion cards have resistance substitution and series resistance calibration. Voltage substitution is usable with all completion cards and employs an external, traceable standard for gain calibration. Automatic zero and gain calibration are implemented in software.



## SPECIFICATIONS

### Constant Voltage Excitation

Voltage .....	Programmable from 0 to 10.24 Volts with 2.5mV resolution.
Current .....	50 mA limited to 70 mA maximum. No damage for continuous short.
Rmt Sensing.....	Full excitation at the transducer with up to 1 Volt line loss.
Regulation .....	Each channel individually regulated, $\pm 0.01\%$ for $\pm 10\%$ line voltage change and no-load to full load.
Stability .....	$\pm 0.01\%$ for 30 days. Temperature coefficient less than $\pm 0.005\%/^{\circ}\text{C}$ .
Noise .....	100 $\mu\text{V}$ RMS, DC to 100 kHz.

### Constant Current Excitation

Output Range .....	Programmable 0.1mA to 50 mA with 12 $\mu\text{A}$ resolution.
Compliance .....	0.1 to 10 Volts.
Regulation .....	$\pm 0.01\%$ or $\pm 0.1 \mu\text{A}$ for $\pm 10\%$ line voltage change.
Noise .....	2 $\mu\text{A}$ or 100 $\mu\text{V}$ RMS, DC to 20 kHz.
Stability .....	$\pm 0.01\%$ or $\pm 2 \mu\text{A}$ for 30 days. Temperature coefficient is less than $\pm 0.005\%$ or $\pm 1 \mu\text{A}/^{\circ}\text{C}$ .

### Excitation General

Auxiliary .....	Resistor settable +5 to +25 Volts is available on certain completion cards. Regulation is $\pm 1\%$ .
Monitor (digital) .....	Excitation voltage, 0.5V/V $\pm 0.05\%$ (0.1V/V $\pm 2\%$ for Auxiliary) or current, 0.1 V/mA $\pm 0.1\%$ .
Monitor (analog) .....	Test points for excitation and sense
Excitation Off .....	Removes excitation from the transducer without changing the setting.
IEPE (6031-CC1) ....	Nominal 6 mA, 24 Volt compliance. User settable from 1 to 20 mA.

### Input

Connection .....	2 to 8 wires with shield.
Configuration .....	Plug-in completion card configures the channel for specific transducer and calibration types. Completion card type is read by software.
Bridge Balance .....	Automatic using program control. Balance accuracy $\pm 0.04\%$ of range, $\pm 1 \text{ mV}$ RTO. Stability $\pm 0.02\%$ for 24 hours, $\pm 0.005\%/^{\circ}\text{C}$ . Bridge balance may be turned off without changing the balance setting.
Input Imped. ....	50 Megohms, shunted by 500 pF.
Input Protection .....	$\pm 50$ Volts differential, $\pm 30$ Volts common mode without damage.

### Calibration

Bridge (Series) .....	Series calibration resistors, $\pm 0.1\%$ , 10 ppm/ $^{\circ}\text{C}$ .
Bridge (Shunt) .....	Two steps of bipolar shunt $\pm 0.1\%$ , 10 ppm/ $^{\circ}\text{C}$ .
RTD .....	Two substitution resistors $\pm 0.1\%$ , 10 ppm/ $^{\circ}\text{C}$ .
Voltage .....	Alternate input for external calibration source. Programmable 1, 0.1 and 0.01, attenuation with $\pm 0.02\%$ accuracy. Attenuator output may be connected to bus for calibration.
Current .....	Current loop calibration resistor, $\pm 0.1\%$ , 10 ppm/ $^{\circ}\text{C}$
Zero Calibration .....	Amplifier input disconnected and shorted for zero calibration.

### Amplifier

Input Range .....	$\pm 2 \text{ mV}$ to $\pm 10$ Volts.
Gain .....	Programmable from 1 to 5,000 with 0.05% resolution.
Gain Steps .....	Sixteen calibrated gain steps are provided: 1, 2, 3, 5, 10, 20, 30, 50, 100, 200, 300, 500, 1000, 2000, 3000 and 5000 with $\pm 0.05\%$ accuracy.
Gain Stability .....	$\pm 0.02\%$ for 30 days, $\pm 0.005\%/^{\circ}\text{C}$ .
Linearity .....	$\pm 0.01\%$ for gains to 1,000, $\pm 0.02\%$ for gains above 1,000.
Common Mode .....	60 dB plus gain in dB to 120 dB for balanced input and 100 dB for a 1,000 Ohm source unbalance, DC to 60Hz.
CM Voltage .....	$\pm 10$ Volts.

Zero .....	Automatic zero to $\pm 2 \mu\text{V}$ RTI or $\pm 1.0 \text{ mV}$ RTO whichever is greater. Zero Stability $\pm 5 \mu\text{V}$ RTI, $\pm 1 \text{ mV}$ RTO at constant temperature, $\pm 1 \mu\text{V}$ RTI/ $^{\circ}\text{C}$ , $\pm 0.2 \text{ mV}$ RTO/ $^{\circ}\text{C}$ . Short term: $\pm 2 \mu\text{V}$ RTI, $\pm 0.4 \text{ mV}$ RTO for 8 hours.
Source Current .....	$\pm 5 \text{ nA}$ , $\pm 0.05 \text{ nA}/^{\circ}\text{C}$ .
Noise (10 kHz) .....	2.0 $\mu\text{V}$ RTI plus 0.3 mV RTO, RMS.
Bandwidth .....	50 kHz (6031), 100 kHz (6031HF) (-3dB) for gains to 1,000.
Slew Rate .....	5 V/ $\mu\text{s}$ .
Overload .....	Recovery time is 120 $\mu\text{s}$ to within $\pm 0.1\%$ for a 10 times overload to $\pm 10$ Volts.

### Filter (Standard)

Type .....	Eight pole, low-pass Bessel (48 dB/octave).
Frequency .....	4 programmable filter bandwidths, 10 Hz, 500 Hz, 5 kHz, 10 kHz and wideband. Other filter frequencies are available on request.

### Filter (Option)

Type .....	Four-pole, low-pass Bessel (24 dB/octave)
Frequency (PF) .....	4 Hz to 1 kHz, 1 Hz resolution, 1 kHz to 10 kHz, 5 Hz resolution, $\pm 2\%$ accuracy.
Frequency (PHF) .....	10 Hz to 1 kHz, 1 Hz resolution, 1 kHz to 20 kHz, 5 Hz resolution, $\pm 2\%$ accuracy.

### Analog-To-Digital Converter

Sample .....	$\pm 50 \text{ nS}$ channel-to-channel time correlation.
Resolution .....	16 bits, two's complement output.
Rate .....	Programmable up to 100 kS/s (6031), 250 kS/s (6031HF).
Linearity .....	$\pm 1\frac{1}{2}$ LSB ( $\pm 0.004\%$ )
Continuity .....	Monotonic to 15 bits.

### Analog Output

Voltage .....	$\pm 10$ Volt full scale, 10 mA.
Impedance .....	Less than 1 Ohm.
Response .....	Programmable filtered or wideband
Monitor .....	Test points for analog output.

### General

Mounting .....	Occupies one slot in Series 6100 enclosures.
Temperature .....	$0^{\circ}\text{C}$ to $+50^{\circ}\text{C}$ operating.

### Input/Output Connectors

All mating connectors are furnished.	
Transducer .....	Each channel has a 9-pin Type D
Output .....	Outputs have a common 9-pin, Type D.
Monitor .....	15-pin Type D.

## ORDERING INFORMATION

### Channel Modules

6131 .....	Two-channel transducer amplifier, 50 kHz bandwidth, 100 kHz sample rate.
6131HF .....	Two-channel transducer amplifier, 100 kHz bandwidth, 250 kHz sample rate.

### Options

6000-PF .....	Programmable filter option, 4 Hz to 10 kHz.
6000-PHF .....	Programmable filter option, 10 Hz to 20 kHz.

### Completion Cards

Specifications are available for individual completion cards.

6031-CC1 .....	Low impedance piezoelectric (IEPE) completion card, AC coupled, 2-20 mA.
6031-CC2 .....	Bridge completion card with series calibration.
6031-CC3 .....	Voltage completion card with Auxiliary (5-25 Volt) excitation output.
6031-CC4 .....	Current (4-20 mA) completion card.
6031-CC5 .....	RTD, potentiometer completion card.
6031-CC6 .....	Bridge or strain gage completion card with shunt calibration
6031-CC7 .....	Strain gage completion card with series calibration.

### Test Fixture

6087-6031 .....	Input/Output Monitor. Fixture with test jacks for transducer inputs, amplifier inputs, excitation, sense, shunt calibration and outputs.
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