



8000

Signal Conditioner/Amplifier

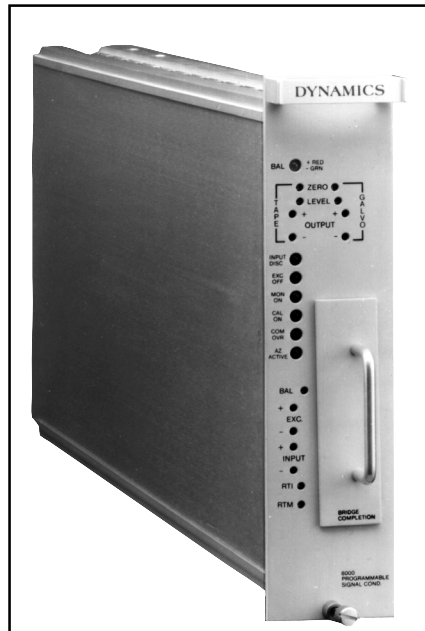
Description

R.C. Electronics Inc. advances the state of the art in signal conditioning with the Model 8000 Computer Controlled Signal Conditioner and Amplifier. The Model 8000 combines the high precision and proven reliability of manually controlled amplifiers with the speed, convenience and accuracy of operation resulting from computer control.

The 8000 offers the operator many advantages, including the ability to quickly and accurately set gain offset, filter cutoff and excitation voltage from a local or host computer. Settings may be made either individually via the computer keyboard or a complete test setup of all amplifiers may be made in seconds using data stored in the host computer memory. In addition, all these parameters can be read back from the 8000 by the host computer to display overall status or provide a permanent printed record. The 8000 also has a status output that, upon interrogation, allows the user to record all settings over the Tape or Galvo output in a PCM coded format.

Interfacing to the host computer is provided by an RS-232C or IEEE-488 bus. An optional portable computer can be used to provide local control via a second dedicated RS-232C port.

The Model 8000 consists of a main frame and a plug-in Bridge Completion Module. The main frame provides the isolated power for the excitation supply and a high precision differential DC amplifier. The Bridge Completion Module allows the user to handle all types of resistance transducers including strain



gauges, RTDs and potentiometers. Each conditioner is fully guarded and isolated as required to maintain signal integrity. System hardware consists of three major components: Model 8000 Signal Conditioner/Amplifiers, a Master Rack and a Slave Rack.

The Master Rack houses the initial group of eight Model 8000s with a Slave Rack for each additional group of eight. Slave Racks can be accommodated to allow system expansion to as many as 2048 Model 8000 units. The Master Rack contains the master microprocessor which communicates with the host computer, the portable local computer and the microprocessor in other Slave Racks. The master microprocessor speaks to all slaves by a round robin serial link, allowing complete data verification between all groups of 8000s.

Each Model 8000 is controlled directly by the microprocessor in its

Features

- Remotely Programmable via RS-232C or IEEE-488
- Programmable Gain
- Programmable Filter
- Programmable Excitation
- Programmable Zero
- Auto Bridge Balance
- Output Status Indicator
- Front Panel Output Monitor
- Tape & Galvo Outputs
- 500 kHz Bandwidth
- ± 300 VDC Common
- Mode Operating Levels
- Output Zero Indicator

Master or Slave Rack. The 8000's precision differential DC amplifier features multiple feedback techniques to reject common mode signals. Input impedance is greater than 50 megohms. Bandwidth is 500 kHz. The power supply's triple-shielded power transformer provides maximum isolation for transducer excitation.

Design Features

Bridge Completion and Shunt Calibration

A versatile plug-in card is provided with the Model 8000 allowing the user to complete two independent bridges via an 8-pole DIP switch. This is an easy means of

Signal Conditioning 8000 Series

7600-0899

Design Features (cont'd)

switching between two bridges of different resistance (e.g. 120 ohm and 350 ohm).

In addition to bridge completion, there are provisions on the plug-in card for mounting up to sixteen Shunt Calibration resistors. This will support up to ± 4 steps of single or double Shunt Calibration. Four resistors are selectable per step of single shunt calibration or two resistors per step of double-shunt calibration.

All transducer input wires (up to 10 conductors plus a shield) are routed through the Bridge Completion card. Included on the card are provisions for the addition of components (resistors and capacitors) for customizing the Model 8000 to suit a wide range of applications. These include but are not limited to the following functions: 1. AC coupling in input signal; 2. Custom voltage dividers for voltage substitution calibration; 3. Versatile bridge completion/shunt calibration.

Automatic Bridge Balance

The Model 8000 offers an extremely convenient and accurate means for automatically balancing the input bridge circuit. The optional "Auto-Zero" circuit senses the polarity of the amplifier output and injects an isolated ratiometric correction voltage into the amplifier's input to effectively null out any zero offset that may be generated by the bridge circuit.

The auto-zero function is activated by a computer command. A front panel LED is illuminated while the auto-zero sequence is in progress.

Two ranges of Auto-Zero Adjustment are provided in both a Ratiometric and Zero Suppression Mode. In the zero suppression mode the computer has full control of the voltage insertion circuit in steps of 40 μV RTI or 1.8 μV RTI allowing the amplifiers' output to be set anywhere from minus to plus full scale.

Filter

The 8000 features provisions for mounting up to 6 plug-in filters in any configuration of 2, 4 or 6 poles using Bessel or Butterworth characteristics. Cutoff frequencies range from 1 Hz to 100 kHz. Each filter is coded with an 8-bit identifying number, which is read and stored by the computer to assure data validity. Filters can be independently selected by the computer to provide either the same or different cutoff frequencies for the tape and galvo output.

Input

Strain Gauges:	One, two adjacent, or two arm opposed or full-bridge
Transducers:	Foil or piezoresistive strain-gauge types Potentiometer RTD

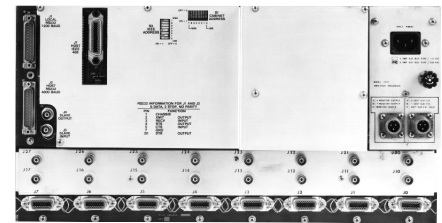
Excitation

Voltage Range:	0.1 to +15 VDC (0.1 to +30 VDC, optional)
Current Range:	0-100 mA, limited at 160 mA max. (constant voltage mode) 1-100 mA, fully adjustable (constant voltage mode)
Line Regulation:	0.005% or 150 μV , for 10% line variation
Load Regulation:	150 μV , +100 $\mu\text{V}/\text{Ohm}$ of lead resistance
Noise:	150 μV p-p max. (0.1 Hz - 20 kHz)
Stability:	0.005%/ C or 100 $\mu\text{V}/\text{C}$ max. 0.01% or 500 μV max. per 8-hour period

Cabinets - 8000 Model

Fully wired for easy plug-in or removal of the Signal Conditioner/Amplifier

Model Number	7931 -X -X
1.....	RS-232 I/O (Master or Slave)
2.....	IEEE 488 I/O (Master Only)
1.....	115 VAC Power 47-63 Hz
2.....	230 VAC Power 47-63 Hz
Cooling.....	Convection
Connectors.....	Input: P/N 57-40140-8
	Output: BNC
	V. Sub: MS-3106E-10SL-35
	Computer: DB25P
	Monitor: MS-3106E-10SL-35
	Slave: BNC
Power Requirements.....	100-125 Vrms (47-63 Hz)
Weight.....	Approx. 21 lbs. (9.55 kg)
Mating Connector Set.....	Specify P/N 086801



Specifications

Amplifier

Gain:	Computer selected gain steps of 1, 2, 5, 10, 20, 50, 100, 200, 500, 1K, 2K, 5K, and 10K. Gains less than 1 and a binary gain sequence are available as options.
Frequency Response	
100 kHz Bandwidth:	$\pm 1\%$ from DC to 10 kHz ± 1 dB from 10 kHz to 50 kHz -3 dB above 100 kHz for gains of 1000 or less
500 kHz Bandwidth:	$\pm 1\%$ from DC to 10 kHz ± 1 dB from 50 kHz to 200kHz -3 dB above 500 kHz for gains of less than 1000
Input Impedance:	50M Ohm shunted by 500 pF common mode

Specifications continued on next page



How to Specify by Model Number

Model 8000 Computer Controlled Signal Conditioner/Amplifier		Model 8010 Plug-in Filter Module	
8000 -X -X -X -X -X -X -X -X		8010 -XXX -X -X	
1	50V common mode and 100 kHz bandwidth	001	1 Hz cutoff (-2 dB)
2	50V common mode and 500 kHz bandwidth	003	3 Hz
3	300V common mode and 100 kHz bandwidth	010	10 Hz
4	300V common mode and 500 kHz bandwidth	030	30 Hz
1	1, 2, 5---10000 gain sequence	100	100 Hz
2	1, 2, 4---8196 gain sequence	300	300 Hz
3	1 above with 0.05 multiplier	01K	1 kHz
4	2 above with 0.05 multiplier	03K	3 kHz
0	Manual RTI zero	10K	10 kHz
1	Programmable RTI zero with Auto zero	30K	30 kHz
0	No galvo output	XXX	custom range from 1 Hz to 50 kHz
1	100 kHz galvo output	2	2 pole low-pass filter
2	500 kHz galvo output	3	3 pole low-pass filter
0	No provision for plug-in filters	4	4 pole low-pass filter
1	Provisions for 6 plug-in filters	6	6 pole low-pass filter
0	No remote monitor and no status output	1	Bessel
1	Remote monitor and status output	2	Butterworth
0	No excitation power supply		
1	0 to 15 VDC and 0 to 100mA		
2	0 to 30 VDC and 0 to 100 mA		
1	115 VAC power 50 - 60 Hz		
2	230 VAC power 50 - 60 Hz		

Specifications (cont'd)

Amplifier (cont'd)

Source Impedance: 0-1,000 Ohm, meets full specifications
0-10,000 Ohm permitted

Gain Stability: $\pm 0.005\%/200$ hr. period, $\pm 0.005\%/C$

Common Mode Voltage: ± 50 VDC (± 300 VDC, optional)

Common-Mode Rejection (gain 1,000): 126 dB, DC - 60 Hz with 0 Ohm unbalance
120 dB, DC - 60 Hz with 350 Ohm unbalance

Slew Rate: 3,77/ μ s, 20V p-p output up to 60 kHz

Noise: $<5 \mu$ V rms RTI, plus 200 μ V RTO at 100 kHz

Calibration

Shunt Calibration: ± 4 steps of single or double shunt calibration capability. Plug-in calibration card provides space for up to (16) shunt calibration resistors and (2) DIP switches for easy shunt select.

Voltage Substitution Calibration: User may install custom voltage divider network on the Bridge Completion Card.

Bridge Completion: Space provided for user to install up to 8 bridge completion resistors and 1 DIP switch (e.g., all arms of a 350 Ohm bridge can be mounted and selected via this method).

Bridge Balance

Manual: T-Balance (standard) or Voltage insertion (optional) via isolated voltage of equal magnitude and opposite polarity injected into the input of the amplifier.

Automatic: Optional feature, auto-balance resolution is one part in 500,000. Low range is ± 15 mV/V of excitation. High range is ± 330 mV/V of excitation. Auto-balance requires less than 10 seconds.

Filter

Type: Plug-in Lowpass Bessel or Butterworth, 2, 4, or 6 pole

Cutoff Frequencies (-3 dB): 1 Hz to 50 kHz (select up to 6 filter modules per 8000)

Amplifier Outputs

Tape Output: ± 10 V @ 10 mA

Galvo Output: ± 10 V @ 100 mA

Protection: Tape & Galvo outputs are individually short-circuit protected

Controls: Front panel zero & level controls provided

Linearity: $\pm 0.005\%$ @ DC

Power: 100-125 VAC or 200-250 VAC, 47-63 Hz, 15 watts max.

Size and Weight

8.75" H x 2.19" W x 18.0" D, 7.2 lbs.