



KEITHLEY AC AMPLIFIERS

*ease the search
for microvolt signals*

The Keithley Model 103 provides the best attainable signal-to-noise ratio for input impedances of either 100 k ohms or 10 megohms. (The equivalent input noise resistance on the low noise position is only 3 k ohms.) Bandwidth of 0.1 cps to 100 kc covers a wide range of uses; eleven high and low frequency cuts permit restricted bandwidths for minimum noise.

Applications include Hall Effect studies, bridge null detection, and semiconductor investigations, as well as such biophysical applications as recording nerve action potentials.

bandwidth 0.1 cps to 100 kc using 11 high and low frequency cutoffs.

input impedance in the "Normal" mode is 10 megohms; in the "Low Noise" mode, 100 k ohms.

amplifier gain either 100 or 1000, adjustable to precise values.

input single-ended or differential.

differential rejection is at least 80 db.

power—from batteries or the Keithley Model 1031, a separate, solid state power supply with noise characteristics equivalent to batteries.

noise performance is selected with a "Normal" and "Low Noise" switch. Chart gives noise level of maximum gain from 10 cps with shorted input.

Frequency of high cutoff point	Maximum noise, microvolts RMS referred to input	
	Normal (10 meg impedance)	Low Noise (100 k impedance)
100 kc	3.0	1.9
30 kc	1.9	1.1
10 kc	1.4	0.8
3 kc	0.9	0.6
1 kc	0.7	0.4
300 cps	0.5	0.3
100 cps	0.4	0.25

prices: Model 103, \$245; rack, \$255
1031 Power Supply, \$245; rack, \$255



The Keithley Model 102B amplifier combines a 400-megohm input with high gain and low noise. It is an ideal scope preamplifier, especially for high source impedance signals. The 102B provides accurate signal amplification from piezo-electric devices; it is excellent for noise studies in solid state research, and shock and vibration analysis.

Features of the unit include a driven shield input, decade gains from 0.1 to 1000, selectable bandwidths of 2 cps to 150 kc or 2 cps to 1.7 mc, and a 5-volt, 50-ohm output for scopes and recorders.

input impedance over 400 megohms at 3 μ f.

low noise level, below 10 μ v rms from 10 cps to 150 kc at maximum gain, input shorted.

gain accuracy of 1% at midband for all gain settings.

rise time of 0.3 μ sec at highest gain.

two accessory low capacitance probes available. **price:** \$335

send for complete specifications . . .



KEITHLEY INSTRUMENTS
12415 EUCLID AVENUE CLEVELAND 6, OHIO

electrometers • micro-microammeters • microvoltmeters • milliohmmeters

1965 (no dates)

Invariance in Automatic Control, 3rd all-union conf., U.S.S.R. (Inst. of Automatics and Telemechanics, Dept. of Technical Sciences, Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

International Union of Biological Sciences, theoretical and applied limnology, 16th congr., Poland. (Polish Acad. of Sciences, Palace of Culture and Sciences, Dworkowa 3, Warsaw)

Diseases and Parasitology, 6th conf., Dushanbe, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Fatigue and Restoration Problems, Congr., U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Geographic Soc. of the U.S.S.R., 4th Congr., U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Information Theory, Statistical Decisions, Functions, and Random Processes, 4th conf, Czechoslovakia. (Czechoslovak Acad. of Sciences, Nardoni tr. 3, Prague 1)

Ionization Phenomena in Gases, 7th intern. symp., Belgrade, Yugoslavia. (Yugoslav Acad. of Sciences and Arts, Zrinski trg. 11, Zagreb 1)

Physico-Chemical Analysis, 5th all-union conf., Moscow, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Forthcoming Events

December

11. Radioisotopes in the Life Sciences, Buffalo, N.Y. (R. F. Lumb, Western New York Nuclear Research Center, Inc., Power Dr., Buffalo 14)

11-13. Heterogeneous Combustion Conf., Palm Beach, Fla. (American Inst. of Aeronautics and Astronautics, 500 Fifth Ave., New York, N.Y. 10036)

13-14. Anatomists, Southern Society, 3rd annual meeting, Birmingham, Ala. (E. G. Hamel, Jr., Dept. of Anatomy, University of Alabama Medical Center, Birmingham 3)

16-17. Non-Linear Processes in the Ionosphere, conf., Boulder, Colo. (R. T. Frost, Natl. Bureau of Standards Boulder Laboratories, Boulder)

16-18. Thin Films, Electrical and Magnetic Properties in Relation to Their Structures, London, England. (Administration Assistant, Institute of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

19-20. Radiation Emergencies in Medicine, Research and Industry, Chicago, Ill. (R. V. Wheeler, Argonne Natl. Laboratory, 9700 S. Cass Ave., Chicago)

19-21. American Physical Soc., Pasadena, Calif. (APS, Columbia Univ., New York 27)

26-28. National Council of Teachers of Mathematics, San Angelo, Tex. (H. T. Karnes, Dept. of Mathematics, Louisiana State Univ., Baton Rouge 3)

26-28. American Geophysical Union, western natl., Boulder, Colo. (W. W. Kellogg, Rand Corp., 1700 Main St., Santa Monica, Calif.)

26-30. American Assoc. for the Adv.

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vancement of Science, Cleveland, Ohio. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

27-29. American Economic Assoc., Boston, Mass. (H. F. Williamson, American Economic Assoc., 629 Noyes St., Evanston, Ill.)

28-29. Linguistic Soc. of America, Chicago, Ill. (H. L. Smith, Jr., Dept. of Linguistics, Univ. of New York at Buffalo, N.Y.)

January 1964

1-4. Solid State Physics Conf., Institute of Physics and the Physical Soc., Bristol, England. (The Institute, 47 Belgrave Sq., London, S.W.1)

7-9. Reliability and Quality Control, natl. symp., Washington, D.C. (American Soc. for Quality Control, 161 W. Wisconsin Ave., Milwaukee, Wis. 53203)

8-11. Radioactive Isotopes in Clinical Medicine and Research, 6th intern. symp., Bad Gastein, Austria. (R. Höfer, Second Medical University Clinic, Garnisonsgasse 13, Vienna 9, Austria)

8-11. National Soc. of Professional Engineers, winter meeting, Phoenix, Ariz. (P. H. Robbins, 2029 K St. NW, Washington, D.C.)

16-18. Royal College of Physicians and Surgeons of Canada, Quebec. (The College, 74 Stanley Ave., Ottawa 2, Ont.)

16-23. Nucleic Acids, symp., Hyderabad, India. (P. M. Bhargava, Regional Research Laboratory, Hyderabad 9)

19-24. American Chemical Soc., 146th natl. meeting, Denver, Colo. (ACS, 1155 16th St. NW, Washington, D.C.)

20-15. Commission for Aeronautical Meteorology, World Meteorological Organization, 3rd, Paris, France. (WMO, 41 Ave. Giuseppe-Motta, Geneva, Switzerland)

20-22. American Inst. of Aeronautics and Astronautics, aerospace sciences mtg., New York, N.Y. (R. R. Dexter, AIAA, 2 E. 64 St., New York 21)

20-23. Cardiovascular Drug Therapy, symp., Philadelphia, Pa. (S. Rosen, Dept. of Medicine, Hahnemann Medical College and Hospital, 230 N. Broad St., Philadelphia 2)

20-24. American Mathematical Soc., Miami, Fla. (AMS, 190 Hope St., Providence 6, R.I.)

20-24. Australian and New Zealand Assoc. for the Advancement of Science, Canberra (J. R. A. MacMillan, Faculty of Agriculture, Univ. of Sydney, N.S.W., Australia)

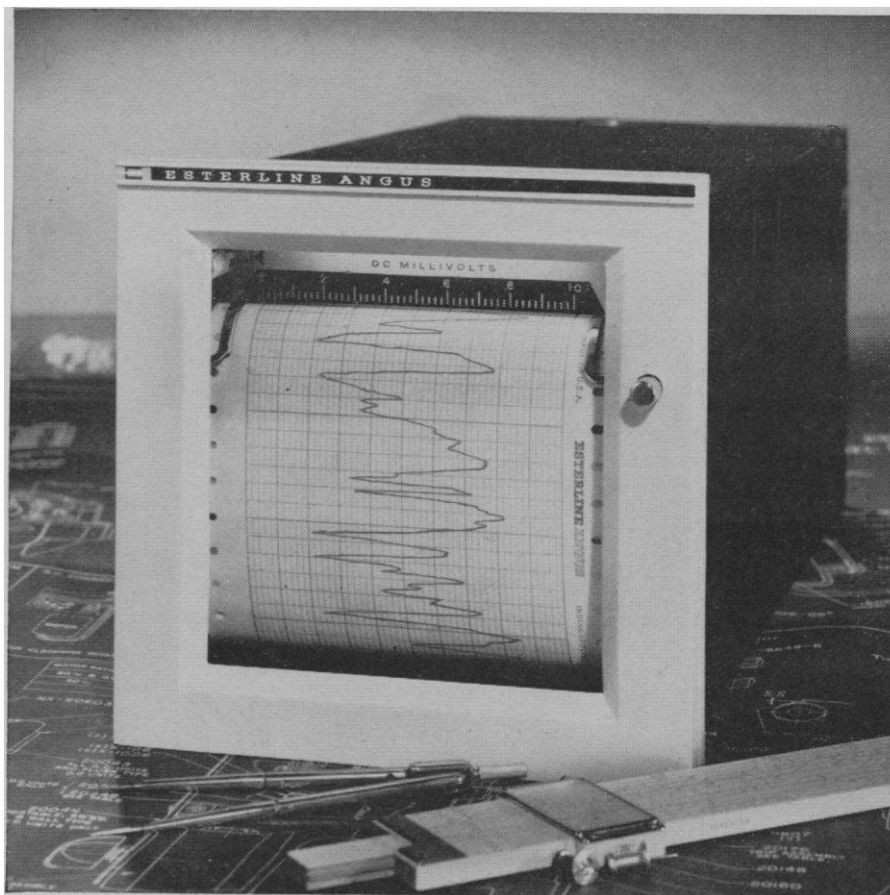
20-27. Agricultural Film Competition, 3rd intern., Berlin, Germany. (Congress Hall, John Foster Dulles Allee, Berlin N.W. 21)

22-25. American Physical Soc., New York, N.Y. (APS, Columbia Univ. New York, N.Y.)

22-25. America Assoc. of Physics Teachers, New York, N.Y. (E. U. Condon, Oberlin College, Oberlin, Ohio)

23. Central Council for Health Education, annual conf., London, England. (Director, CCHE, Tavistock House, Tavistock Sq., London, W.C.1)

23-24. Industrial Water and Waste Conf., Austin, Tex. (J. B. Maline, Jr., 305 Engineering Laboratories Bldg., Univ. of Texas, Austin 12)



(Illustrated: Flush recorder with 8" x 8" front. Portable "Labgraph" also available.)

New Speedservo...swift, sure, simple, small!

High Speed: $\frac{1}{8}$ second full scale response. Records 4 cycle signals without significant attenuation. • **Versatile:** Accommodates DC circuits with output impedance 100,000 ohms or less. • **Sensitive:** 0-1 MV DC without jitter. Many higher ranges. Accuracy $\frac{1}{2}\%$. • **Efficient:** Raymond Loewy styled 8" x 8" case front conserves valuable panel space. Full 6" wide 100' long chart. • **Convenient:** Dial 14 chart speeds from $\frac{3}{4}$ " per hour to 6" per second. "Drop in" chart loading. Disconnect and pull chassis from case in seconds. Chart supply indicator. • **Less Maintenance:** Simple linear motion pen motor, no strings, no pulleys. Zener reference voltage. Infinite resolution glass hard potentiometer prevents hunting.

In addition to "Speedservo" and the new "Labgraph" with sloped writing surface, the radically new EA "Graph" Line of rectilinear recorders includes both single and two-channel DC Microammeters, DC Milliammeters, AC or DC Ammeters or Voltmeters, plus inkless and ink type event recorders. *Your inquiry is invited.* If desired, Esterline Angus will gladly adapt standard instruments to your needs, or develop new ones for you. *Write for new "Graph" Line Brochure.*

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