BAK ELECTRONICS, INC. Biomedical Instrumentation
41301 Silver Drive, Umatilla, FL 32784 / Office: 407-324-2907 / e-mail: bakinc@rcn.com

AC Bridge Integrator

Model ABI-1

GENERAL PURPOSE AC VOLTAGE AND IMPEDANCE DETECTOR FOR:

IMPLANTABLE MUSCLE LENGTH AND JOINT
- ANGLE GAUGES
- FOOTFALL DETECTION
- EMG INTEGRATION
- TISSUE IMPEDANCE

1-100 KILOHM PRECISION BA LANCING
SELECTABLE CARRIER FILTERS AND INTEGRATION TIMES
GAIN AND LEVEL CONTROLS

Description:

A general purpose signal processor for physiological devices employing AC carrier detectors such as tissue impedance measurements, implantable muscle length and joint angle gauges, footfall detection during locomotion, and for envelope conversion of EMC, EEG, and other AC biological signals. The instrument contains a resistive bridge-balancing circuit, variable gain amplifier (100 Hz-1OO kHz bandwidth), halfwave rectifier, and variable time constant RC integrating circuit. An input switch enables the bridge circuits to respond only to high frequency carriers (100 Hz, 1 kHz, and 20 kHz cut-off), rejecting lower frequency biological and electrical noise. Continuously variable DC offset and gain adjustments on the output allows optimal use of the dynamic range of recording and digitizing devices (j 10 V range).

* Loeb, Walmsley, and Duysens, "Obtaining Proprioceptive Information from Natural Limbs," in Physical Sensors for Biomedical Applications, Ed. Neuman, Fleming, Cheung and Ko, CRC Press, Boca Raton, 1980.

* Chapin, Loeb, and Woodward, "A Simple Technique for Determination of Footfall Patterns of Animals During Treadmill Locomotion," J. Neurosci. Methods 2:97-102, 1980.

Applications:

There are two general modes of use: If the signal source is a variable impedance (e.g. length gauge tissue probe), a constant amplitude AC signal of the desired frequency must be supplied to AC IN the source connected across the TEST ARM (ground referenced). The BALANCE potentiometer is adjusted to produce the desired sensitivity to fluctuations around the test impedance and AC ATTEN may be turned down to minimize the signal being injected into preparation. The impedance fluctuations converted into an amplitude modulated carrier (AC OUT) which is half-wave rectified and through the integrator circuit, producing DC OUT. If the signal source is already an amplitude modulated AC signal (footfall detector, BMG signal, etc.), this signal is applied to the AC IN and a dummy put across the TEST ARM (10 k resistor supplied, bridge BALANCE then controls signal gain). '~ FILTER may be used to strip off undesired lower frequency signals (e.g. EMG, EKG) before the integrated circuit demodulates the AC signal into its envelope at DC OUT. In both applications, the user appropriate integration time constant (T =1,5,10,20, or 50 msec) for his carrier frequency and the response time (amount of smoothing) desired.

Specifications:

Bridge Arm Resistance	100 kilohm 1%
Bridge Balance Potentiometer	100 kilohm 10 turn with graduated knob
AC IN Input Coupling	Capacitive
AC IN Input Impedance	100 kilohm
AC IN Input Attenuation	0.01 to 1.0
DC Output Gain	X1 to X10
DC Output DC Level Adjust	Adjustable through zero, -10 V to calibrated 0
Low Frequency Cut-Off Ranges	100 Hz, 1 kHz and 20 kHz
Integrator Time Constant	1, 5, 10, 20 and 50 milliseconds
Bandwidth of Bridge Amplifier	100 kHz
AC Output Impedance	100 ohms
DC Output Impedance	100 ohms
Power Requirements	+/- 15 volts supplied by the Model RP-1, +/-25 ma
Size	2.8"w x 5.25"h x 7.25"d
Weight	1 lb.

Other BAK equipment often used with ABI-1

MDA-1,2 AC Amplifiers
RG-l Raster Stepper

Contact us at:
Bak Electronics, Inc.
41301 Silver Drive
Umatilla, FL 32784
Office: 407.324.2907
Fax: 407.308.0455
info@bakelectronicsinc.com
bakinc@rcn.com

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