

Instrumentation Amplifier

(Order Code INA-BTA)



Our Instrumentation Amplifier is used to condition signals to be compatible with Vernier interface products. The amplifier provides the necessary gain and offset to allow you to connect a wide variety of measurement equipment to your interface and electronically collect, store, and analyze the data.

Although you may calibrate your software to display otherwise, your interface unit can only measure a potential difference (voltage). Many laboratory instruments produce a voltage that varies as the instrument reading changes. Examples include gas chromatographs, spectrophotometers, light meters, and sound meters. If you are familiar with electronics, you may be able to go inside the instrument and find out where to measure this voltage signal. Some instruments have chart recorder terminals that are designed for this purpose. Test the voltage range of this signal. If the voltage happens to vary over a range that matches your interface, then the signal can be fed directly to the interface and monitored by the software. More likely, the voltage signal will need to be amplified before it can be monitored.

Note: Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

Compatible Software

See www.vernier.com/manuals/ina-bta for a list of software compatible with the Instrumentation Amplifier.

Getting Started

1. Connect the sensor to the interface (LabQuest Mini, LabQuest 2, etc.).
2. Start the appropriate data-collection software (Logger Pro, Logger Lite, LabQuest App, or Graphical Analysis 4) if not already running, and choose New from File menu. The software will identify the sensor and load a default data-collection setup. You are now ready to collect data.

If you are collecting data using a Chromebook™, mobile device such as iPad® or Android™ tablet, or a Vernier wireless interface, please see the following link for up-to-date connection information:

www.vernier.com/start/ina-bta

Using the Product

Using the Instrumentation Amplifier with a Gas Chromatograph

If your voltage readings are noisy, you should connect the Earth ground of the Gas Chromatograph to the black post on the end of the Instrumentation Amplifier box where the sensor cable is located. Connecting the Earth ground in this way should reduce or eliminate any electronic noise.

Also, keep in mind that Logger Pro software and LabQuest App both have Peak Integration tools that can be used to integrate and quantify GC peaks. Once you have collected GC data, you can simply choose Peak Integration from the Analyze menu. On this dialog, you can select and integrate peaks one at a time.

Using the Instrumentation Amplifier as a Current Meter

The Instrumentation Amplifier can be used to monitor current instead of voltage. By placing a resistor between the terminals, the voltage amplified becomes proportional to the current according to

$$I = (V/G)/R$$

where V is the voltage read, G is the gain setting of the amplifier, and R is the resistor value. To monitor current in a circuit, you want to choose a small resistor value; for example 0.1Ω or 1Ω resistor with a rating of at least 1W.

For monitoring a current output device, you will need to choose a termination resistor that is appropriate for that device (call for details or consult the manufacturers specifications). For best accuracy, perform a calibration using an open circuit and a known current source. One of the Vernier Current Probes can be used for this application.

Specifications

Gain settings	150, 75, 7.5, 15, 3, and 1.5±5%	
Linearity	1%	
Power	2.5 mA @ 5VDC	
Frequency response	0-10kHz (f3dB)	
Impedance	1MΩ to ground	
Calibration values		
+/-1V	slope: 0.471648	intercept: -0.8584
+/-200mV	slope: 0.117912	intercept: -0.2146
+/-20mV	slope: 0.013181	intercept: -0.02399
0-1V	slope: 0.308642	intercept: 0
0-200mV	slope: 0.062617	intercept: 0
0-20mV	slope: 0.006636	intercept: 0

Care and Maintenance

Do not wrap the cable tightly around the sensor for storage. Repeatedly doing so can irreparably damage the wires and is not covered under warranty.

How the Sensor Works

The amplifier is a monolithic instrumentation amplifier with variable gain and offset settings. An instrumentation amplifier contains precision feedback components and circuitry that is necessary for small signal amplification.

The Instrumentation Amplifier does three primary tasks:

- Provides six different gain settings to amplify small signals to levels appropriate for our interfacing equipment.
- Offsets the voltage so it is always in the range of 0 to 3.5 volts. This allows the amplifier to be used with negative signals even though some of our interfaces only use 0-5 V inputs.
- Provides filtering of high frequency signals. Wires that connect the instrument to the amplifier are prone to pick up electrical noise much like a radio antenna. By filtering out these signals, only the data of interest are left.

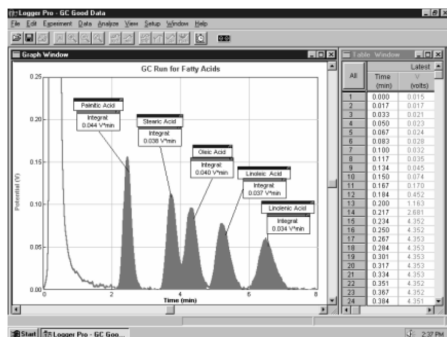
When set to the 20 mV, 200 mV, and 1 V positions, the amplification is set to 150, 15, and 3 respectively. The difference in voltage at the red and black terminal is amplified and output with reference to ground.

When set to ± 20 mV, ± 200 mV, and ± 1 V setting, the amplification is set to 75, 7.5, and 1.5 respectively. The difference in voltage at the red and black terminal is amplified and output with reference to 1.85 V.

Tips

Amplify an Instrument's Chart Recorder Output

Many lab instruments provide a low voltage output designed for interfacing to a chart recorder. You may use these outputs with the Instrumentation Amplifier to interface to a computer. This graph shows the output of a gas chromatograph processing a sample of fatty acids dissolved in toluene solvent.



Data collected using an Instrumentation Amplifier and GOW-Mac Series 350 Gas Chromatograph

Troubleshooting

For troubleshooting and FAQs, see www.vernier.com/til/1418

Repair Information

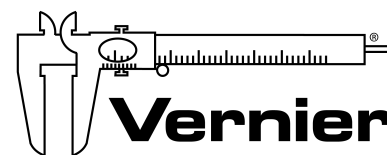
If you have followed the troubleshooting steps and are still having trouble with your Instrumentation Amplifier, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

Accessories/Replacements

Item	Order Code
Resistivity Rod Set	RRS

Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use. This warranty covers educational institutions only.



Vernier Software & Technology
13979 SW Millikan Way • Beaverton, OR 97005-2886
Toll Free (888) 837-6437 • (503) 277-2299 • Fax (503) 277-2440
info@vernier.com • www.vernier.com

Rev. 01/31/20

Logger Pro, Logger Lite, Graphical Analysis, Vernier LabQuest, Vernier LabQuest Mini, and other marks shown are our trademarks or registered trademarks in the United States.

iPad is a trademark of Apple Inc., registered in the U.S. and other countries.

All other marks not owned by us that appear herein are the property of their respective owners, who may or may not be affiliated with, connected to, or sponsored by us.