



## FLORIDA RESEARCH INSTRUMENTS, INC.

Florida Research Instruments, Inc. is a biomedical research and development company. We do design and consulting in the behavioral pharmaceutical area. In addition we are developing our product line; **Modules for Biomedical Engineering Education using National Instruments myDAQ and ELVIS.**





**FLORIDA RESEARCH INSTRUMENTS, INC.**

## **Modules For Biomedical Engineering Education Using National Instruments myDAQ and ELVIS**

FRI-100-1

### **Ultrasonic Microphone (FRI) and Amplifier FRI-100-1 Microphone Alone**



This 1/4" Free-Field Microphone has been designed to Measure low level signals. The combination of our ultrasonic microphone and amplifier is 250 times greater than a G.R.A.S. or Bruel & Kjaer microphone and preamplifier (4 mv/Pascal vs. 1 volt/Pascal). From the factory we calibrate the FRI-100-1 to 10 dB less than 1 Volt/Pascal. This is equal to a G.R.A.S. 1/4" microphone and preamplifier (46BF) and their sound module set to + 40 dB.



Sensitivity: Up to 1V/Pascal

Linearity/Frequency Response: 500 Hz-100KHz +/- 3 dB BSL

Noise Level: 58 dB at 1 KHz

Polarization Voltage: Self Polarizing

FRI-100-2

### **Four Ultrasonic Microphones (FRI) and Amplifiers**



This module contains 4 of the FRI-100-1 microphones and amplifiers. There are BNC outputs on the front panel for the 4 amplifiers. On the back panel is a 68 pin D connector that connects to either the NI DAQs PCIe-6351 or PCIe-6361. In addition there are 2 BNC connectors that have the digital to analog outputs DAC-1 and DAC-2 of these DAQs. It is assumed that this module would be used for 4 channels with sampling rate of 250 KHz. Since the NI ADC is not a Sigma-Delta type an anti-aliasing filter is required. A 7 pole Chebyshev filter with a cutoff frequency of 100 KHz is provided for each channel.

Number of Channels: 4

Amplifier Output Connectors: BNC

DAQ Connector: 68 pin D connector

Anti-aliasing Filter: 7 pole Chebyshev,  
Cutoff Frequency 100 KHz (4 provided )

Digital to Analog Connectors: 2 BNC

## FRI-100-3 Ultrasonic Speaker and Amplifier



The Ultrasonic Speaker and Amplifier (FRI-100-3) was designed as a signal source for use with the Advantest 3361 Spectrum or similar Analyzer and the FRI-300-2 Acoustical Test Chamber. The signal is normalized by inputting it to a G.R.A.S. or Bruel & Kjaer ¼" Free-Field Microphone and select the normalize function on the Spectrum Analyzer. The test microphone can then be placed in the in the position of the G.R.A.S. or Bruel & Kjaer and the Spectrum Analyzer will produce an Amplitude Response Plot of the test microphone.

Sensitivity/Gain: 126 mv rms at 50 KHz yields 1 Pascal  
 Input Connector: BNC  
 Polarization Voltage: 200 Volts  
 Usable Frequency Range: 10 KHz – 100 KHz

## FRI-200-1 FRI-200-1 Sound Module For G.R.A.S./Bruel & Kjaer (Microphone Not Included)



This Sound Module provides the 28 voltage and polarization volts together with amplification of +50 dB for a G.R.A.S. ¼" Microphone and Preamplifier (46BF) or a Bruel & Kjaer ¼" Free-Field Microphone and Preamplifier (4939).

Input Connector: 7 Pin Lemo  
 Output Connector: BNC  
 Polarization Voltage: 200 Volts DC  
 Sensitivity/Gain: 1 V/P Gain + 50 dB

## FRI-200-1A FRI-200-1 Sound Module For G.R.A.S./Bruel & Kjaer with Filters



This module is similar to the FRI-200-1 with the addition of selectable filters for A Weighting , Direct, and High Pass. It has gain settings of +0 dB, 10 dB, +20 dB, +30dB, +40 dB and + 50dB.

This Sound Module provides the 28 volts and polarization voltage together with amplification of +50 dB for a G.R.A.S. ¼" Microphone and Preamplifier (46BF) or a Bruel & Kjaer ¼" Free-Field Microphone and Preamplifier (4939).

Filters: A Weighting: Human Ear Response	Output Connector: BNC
High Pass: 20 Hz 3 pole Butterworth -1 dB at 20 Hz	Polarization Voltage: 200 Volts DC
Input Connector: 7 Pin Lemo	Power Supply: +28 Volts

## FRI-200-2

### Four Channel Sound Module For G.R.A.S./Bruel & Kjaer

(Microphone Not Included)



This module contains 4 of the FRI-200-1 amplifiers and anti-aliasing filters. There are BNC outputs on the front panel for the 4 amplifiers. On the back panel is a 68 pin D connector that connects to either of the NI DAQs PCIe-6351 or PCIe-6361. In addition, there are 2 BNC connectors that have the digital to analog outputs DAC-1 and DAC-2 of these DAQs. It is assumed that this module would be used for 4 channels with a sampling rate of 250 KHz. Since the NI ADC is not a Sigma-Delta type an anti-aliasing filter is required. A 7 pole Chebyshev filter with a cutoff frequency of 100 KHz is provided for each channel.

Number of Channels: 4

Input Connector: 7 pin Lemo

Amplifier Output Connectors: 4 BNC

DAQ Connector: 68 pin D connector

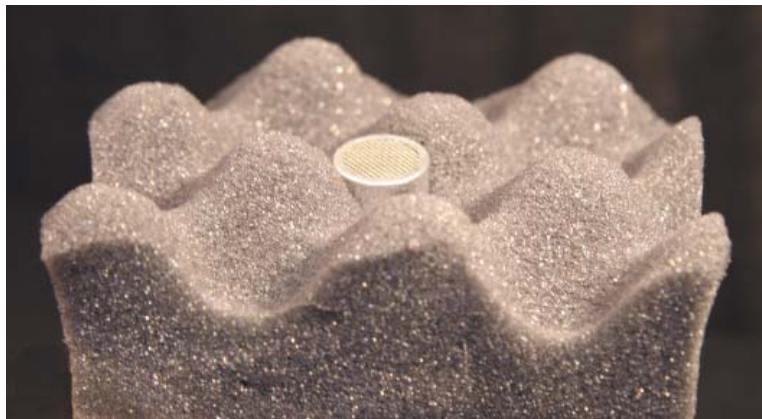
Anti-aliasing Filter: 7 pole Chebyshev,  
Cutoff Frequency 100 KHz (4 provided)

Digital to Analog Connectors: 2 BNC

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## FRI-300-1

### Ultrasonic Free-Field Calibrator



This calibrator provides a test signal of 94 dBa at 50 KHz. Other frequencies and levels can be provided on request. Its intended use is as a test signal in a free-field environment not as a microphone calibrator.



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## FRI-1000-1 Physiological Amplifier



This general purpose Physiological Amplifier can be used to measure most physiological parameters such as ECG, EEG, EMG, etc. Optical isolation of all signals is provided.

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## FRI-1000-2 Skin Conductance Response (GSR)



The Skin Conductance Response (GSR) module sometime referred to as GSR has an analog out in micromohs (microsems). Two calibration push buttons add either 1 or 5 micromohs (microsems) to the signal. Optical isolation of all signals is provided.

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## FRI-1000-3 Photoplethysmograph

The Photoplethysmograph module provides an indication of heart rate and an analog signal. The analog output is on a BNC jack and a flashing LED illuminates with each heart beat. Optical isolation of all signals is provided.

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## FRI-1000-4 Dual Temperature for YSI Probes

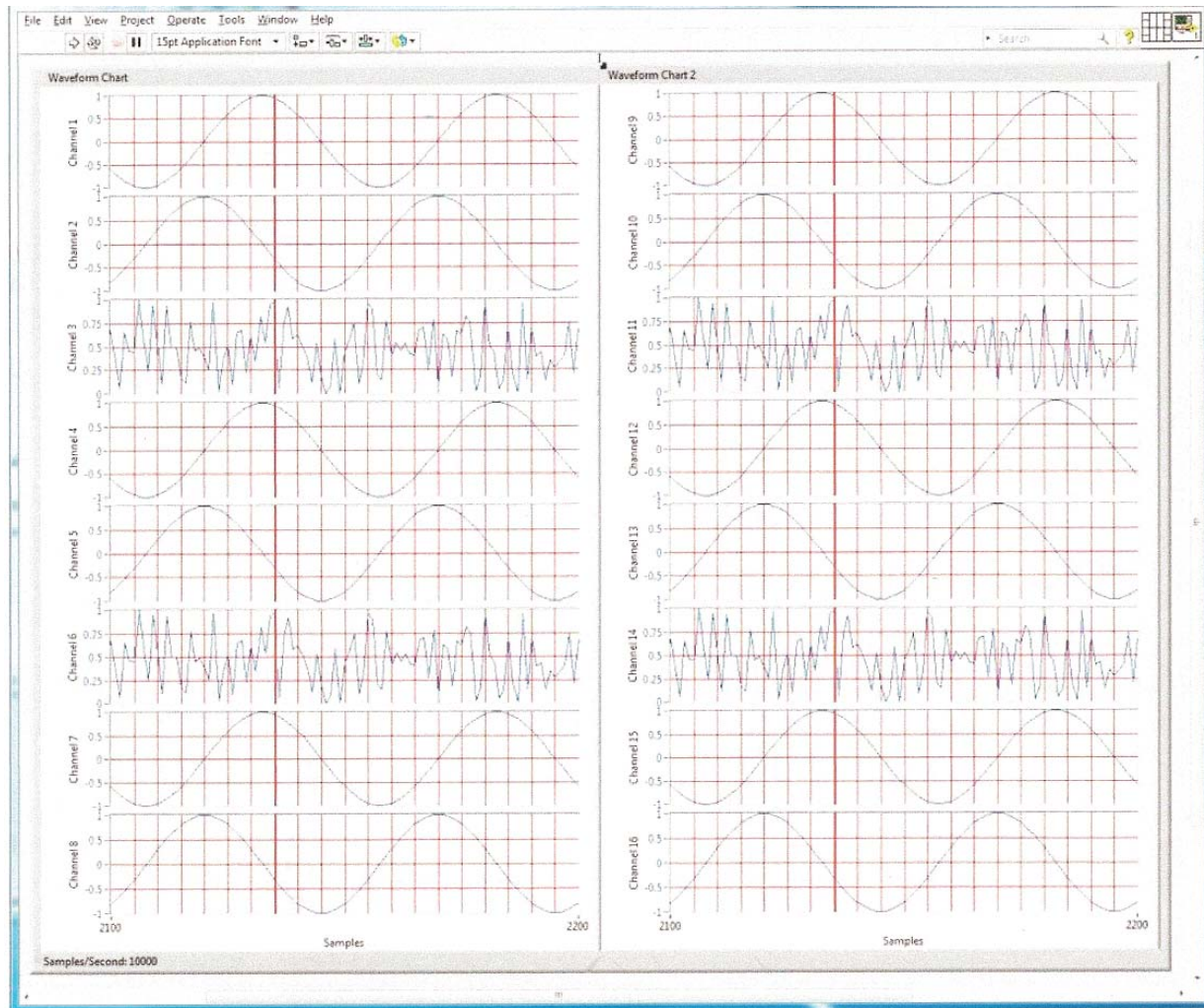


This temperature module can be used with 2 YSI style probes. They can be used individually or differentially. The output is either in degrees F or C.

## FRI-2000-1 Display System

These VI s provide a convenient way to display in an electronic strip chart recorder format physiological signals. 16 Channel and 8 Channel displays are shown.

A 2 Channel display is also provided for use with myDAQ.

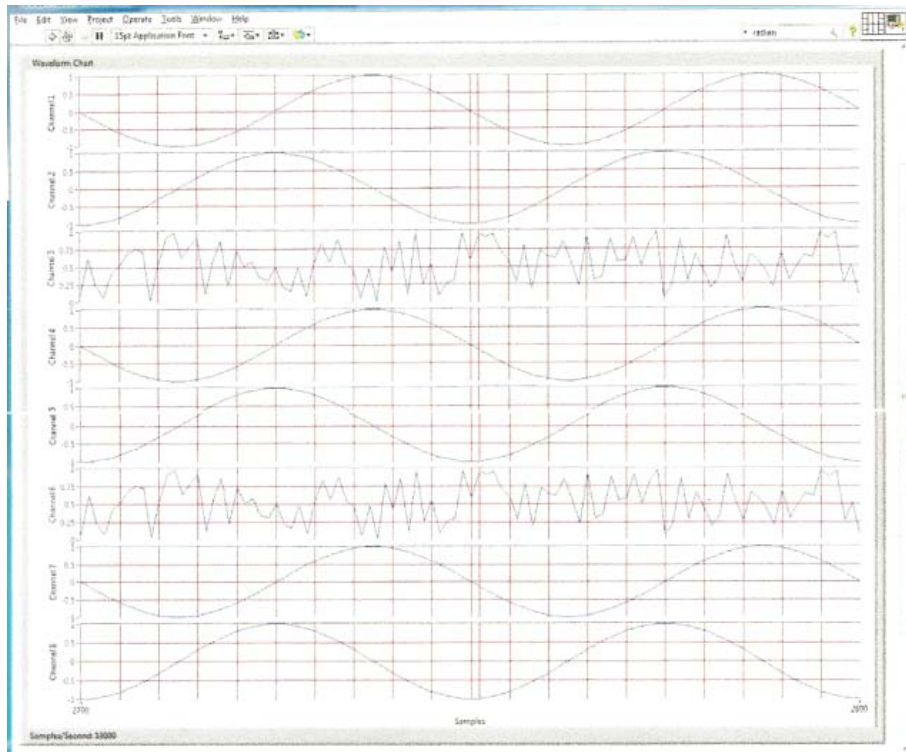


16 Channel Display

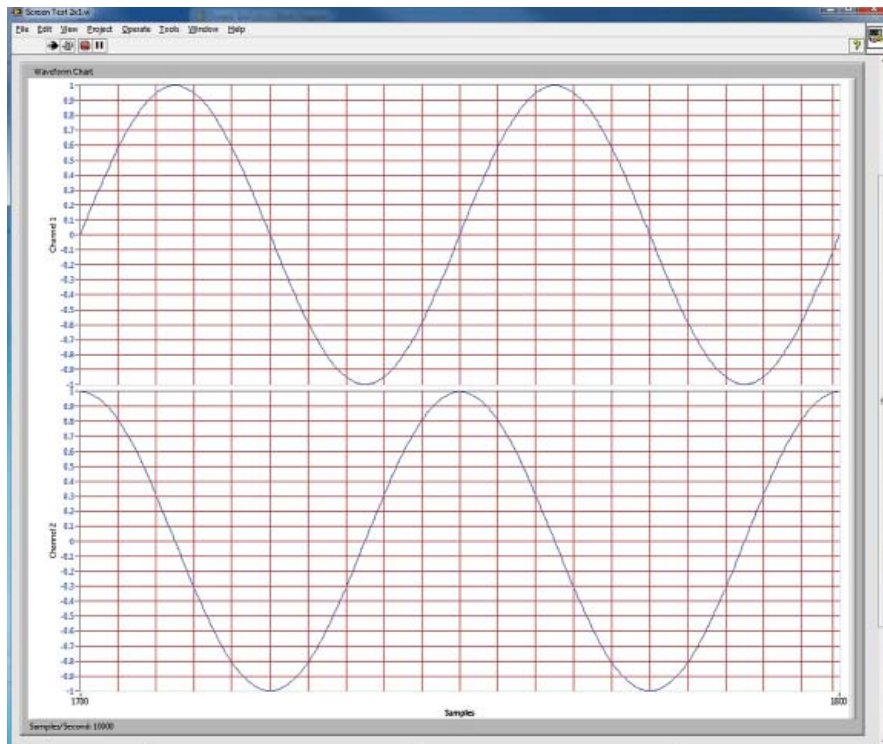


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8 Channel Display



2 Channel Display

## FRI-2000-3 IN/OUT Cabinet and Cable For NI DAQ

The FRI-2000-3 Provides a convenient way to connect signal conditioners to NI PCIe cards. The inputs are BNC jacks and the rear connector is a DB-38 that connects to an NI cable.



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