



Automated Biological Monitors: Has Their Time Arrived?

David Gruber, Ph.D.
President
Biological Monitoring, Inc.
Blacksburg, VA



Environmental Services: Since 1980

- Aquatic Toxicity Testing
- Treatability Studies
- Stream Bioassessments
- Environmental Impact Assessments
- Mitigation Plans
- Total Maximum Daily Loads
- Site Specific Standards Modifications
- TSCA Product Registration

The BioSensor[®]

- The Canary in the Mine Concept
- Fish Serve As Sensors
- Provide Broad Based Detection
- Continuous Sensors Provide Timely Warning
- Complement Other Security Measures to Provide Safety at a Reasonable Cost

RATIONALE

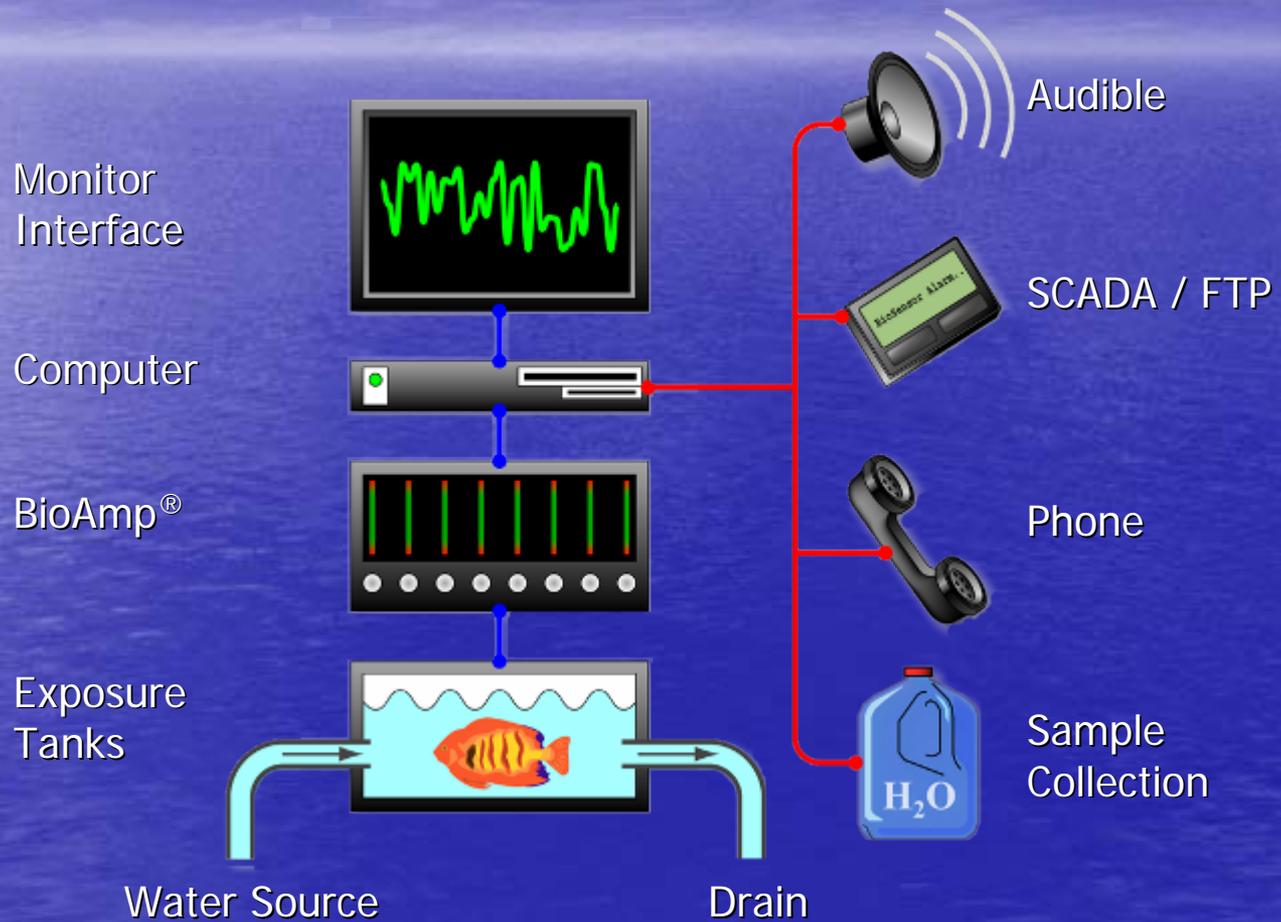
- Fear of contamination
- Minimize risk
- Enhance public's trust
- Need for broad scope early warning
- Easy to set up, operate and maintain
- Cost effective

Desired Characteristics of Automated Biomonitorors

- Automated
- Real time
- On-line
- Sensitive
- Rapid response
- Easily interpretable alarms
- Reliable alarms
- Minimal false alarms
- Reliable technology
- Commercially available
- Inexpensive
- Minimal installation
- Minimal training
- Minimal maintenance

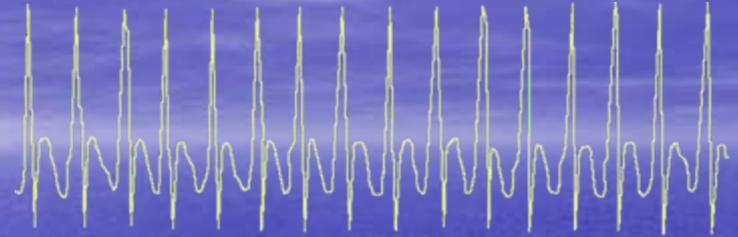


BIOSENSOR[®] 7008

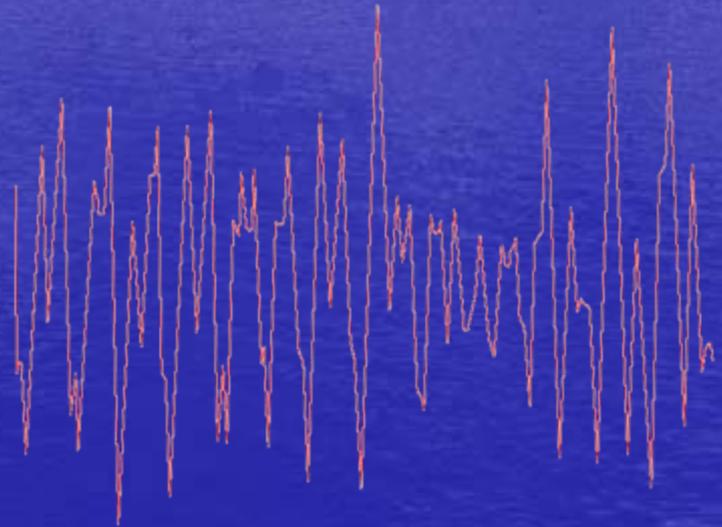


VENTILATORY RESPONSES

Normal Baseline

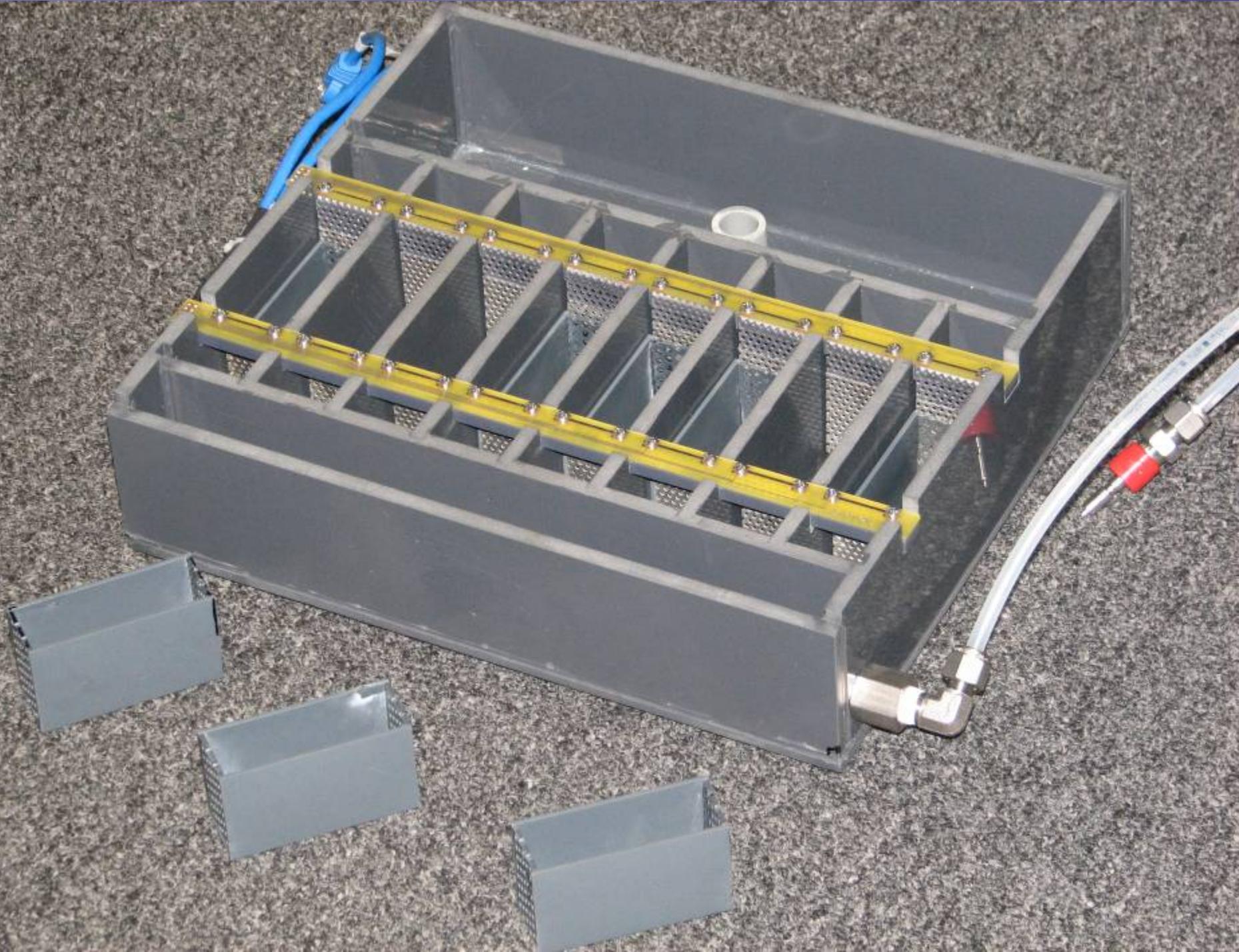


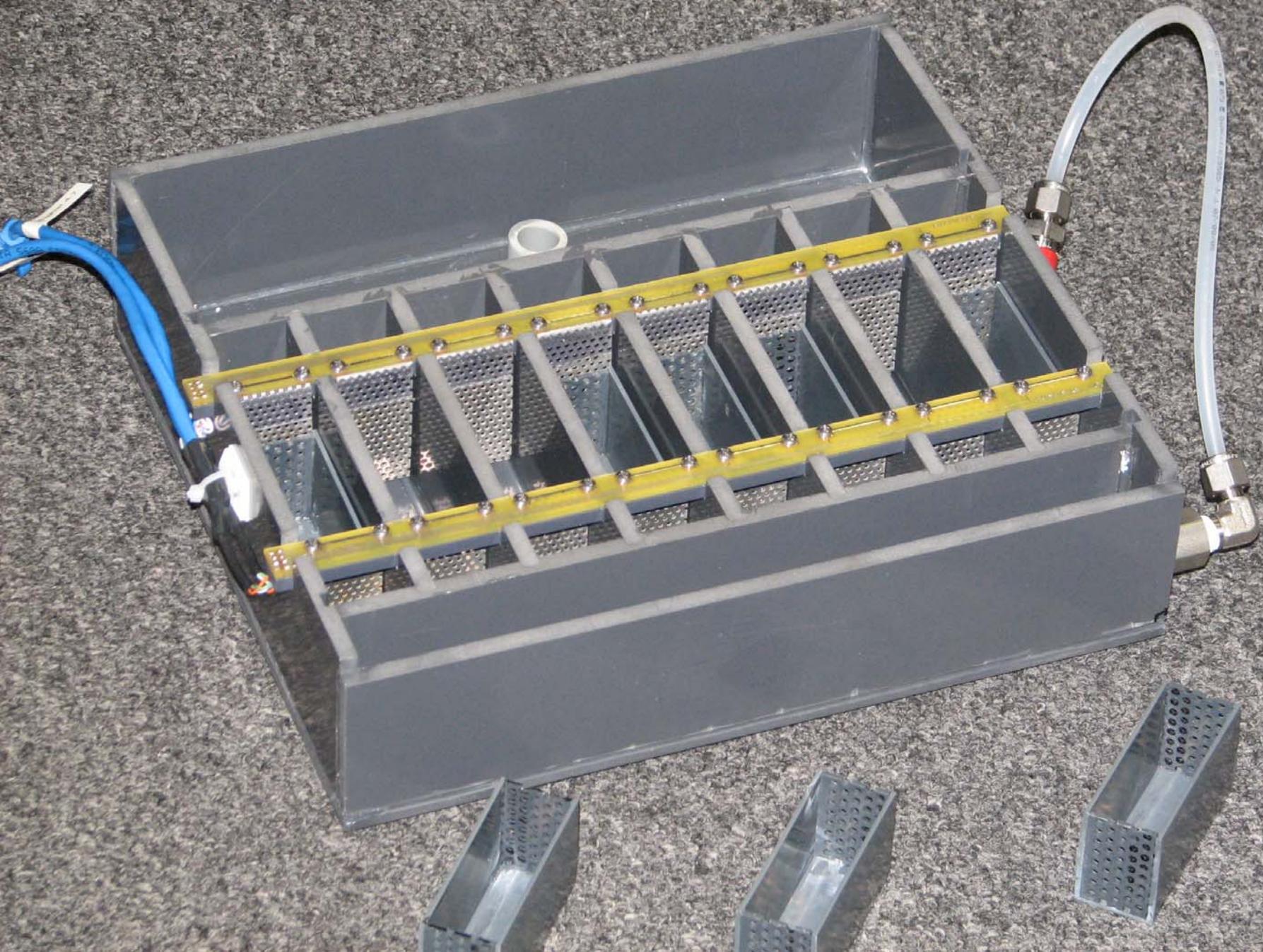
Increased Frequency,
Amplitude, and Variability

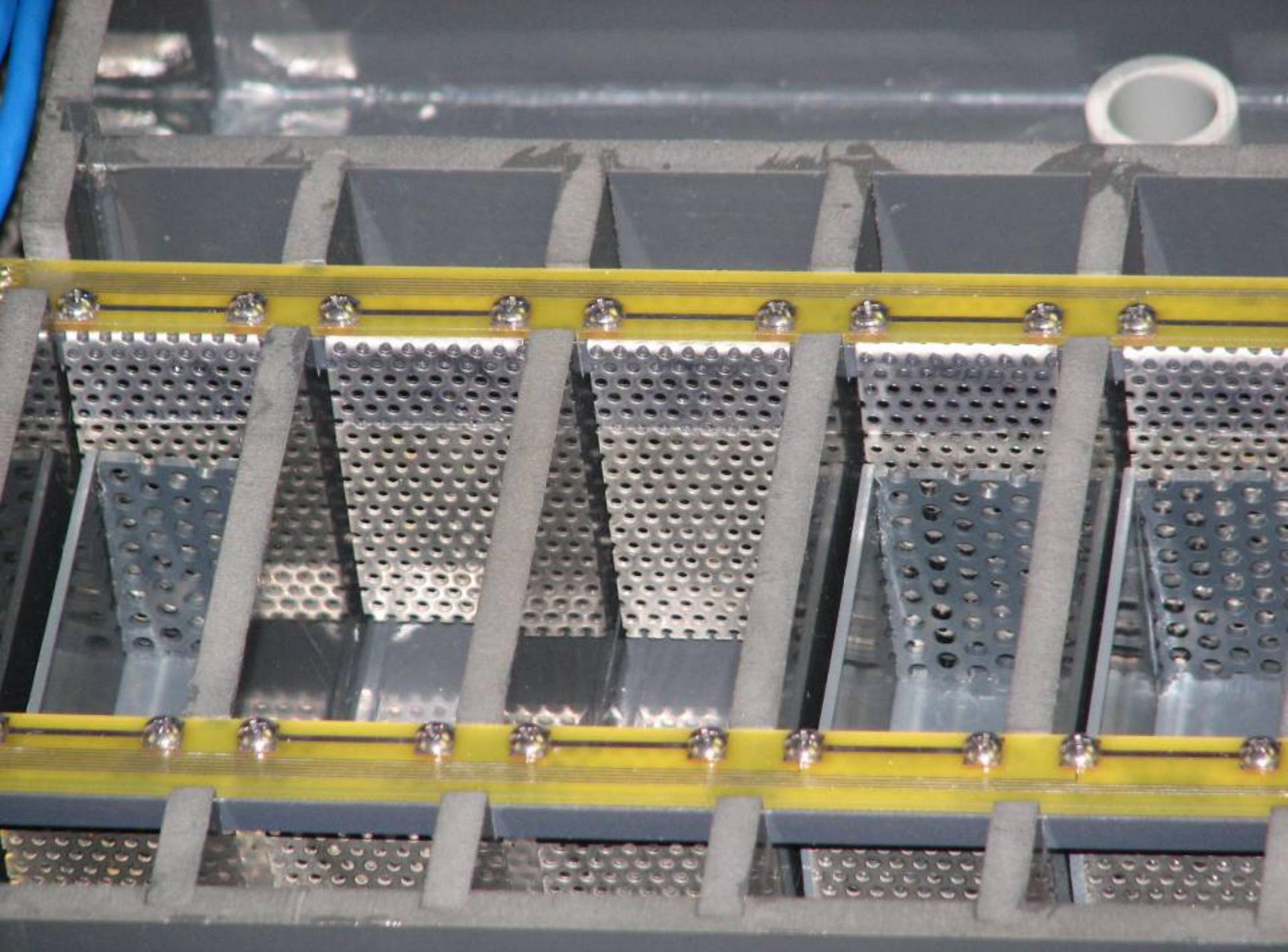


Decreased Amplitude,
Increased Gill Purges

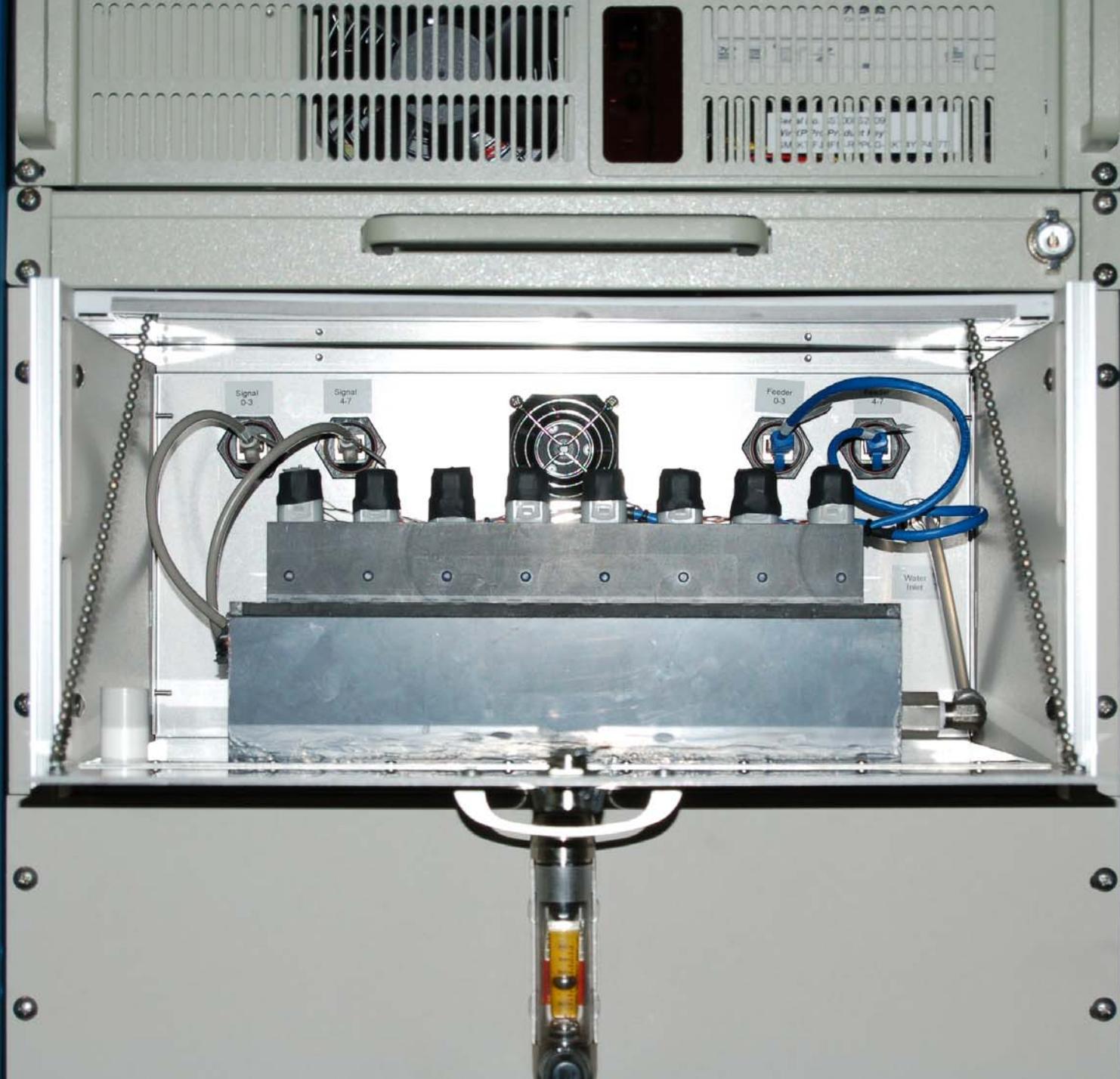




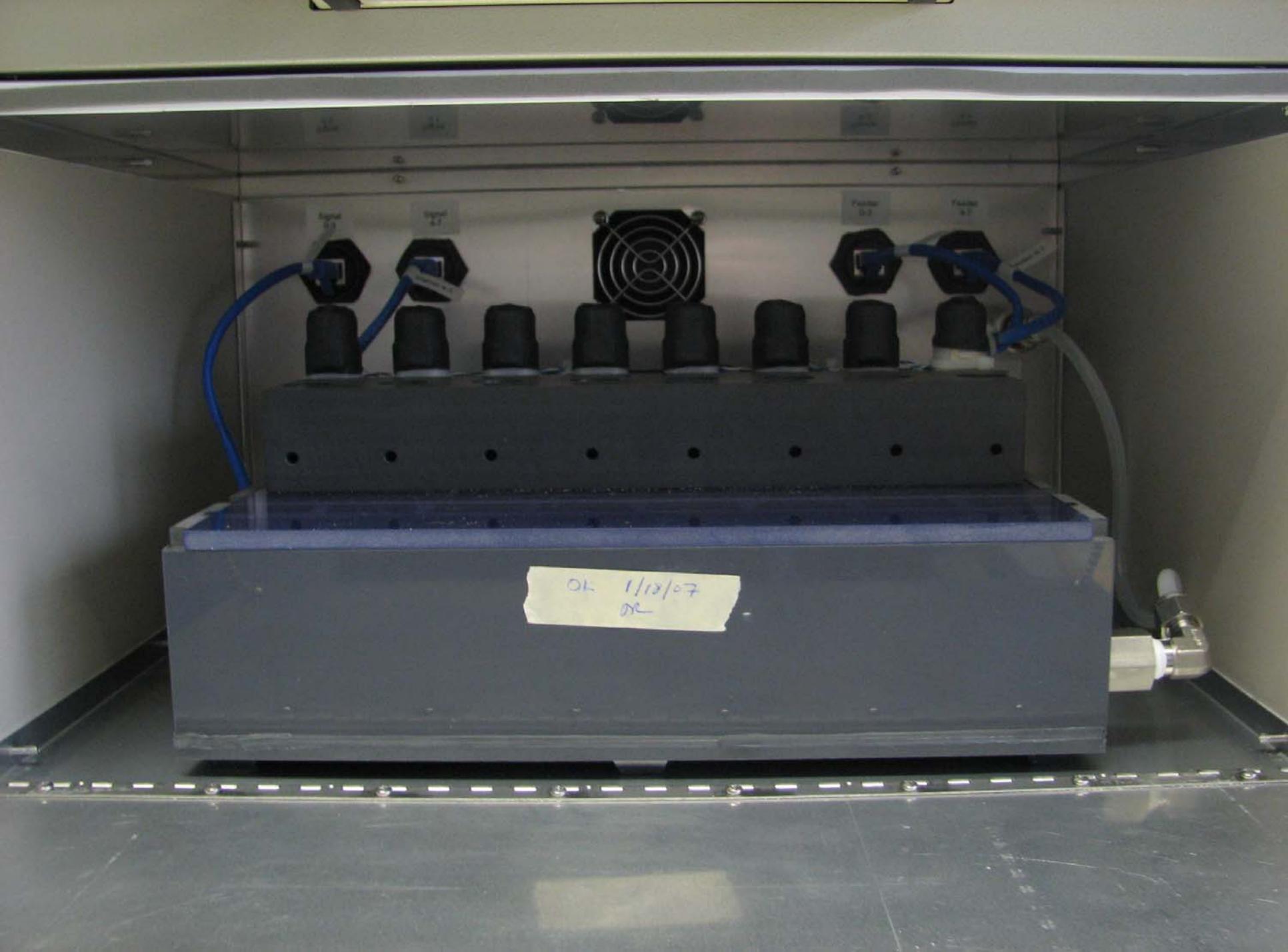












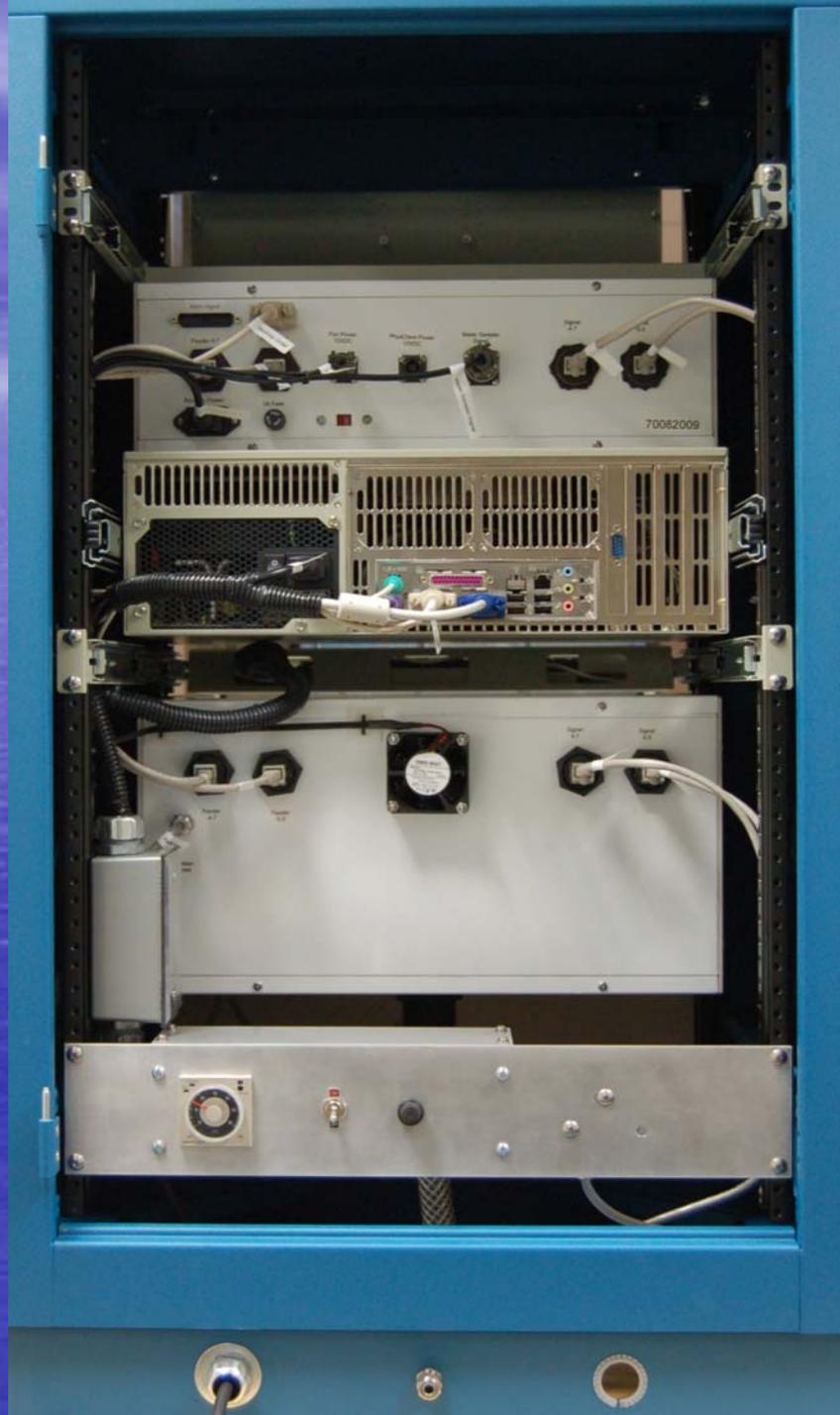
Signal 1

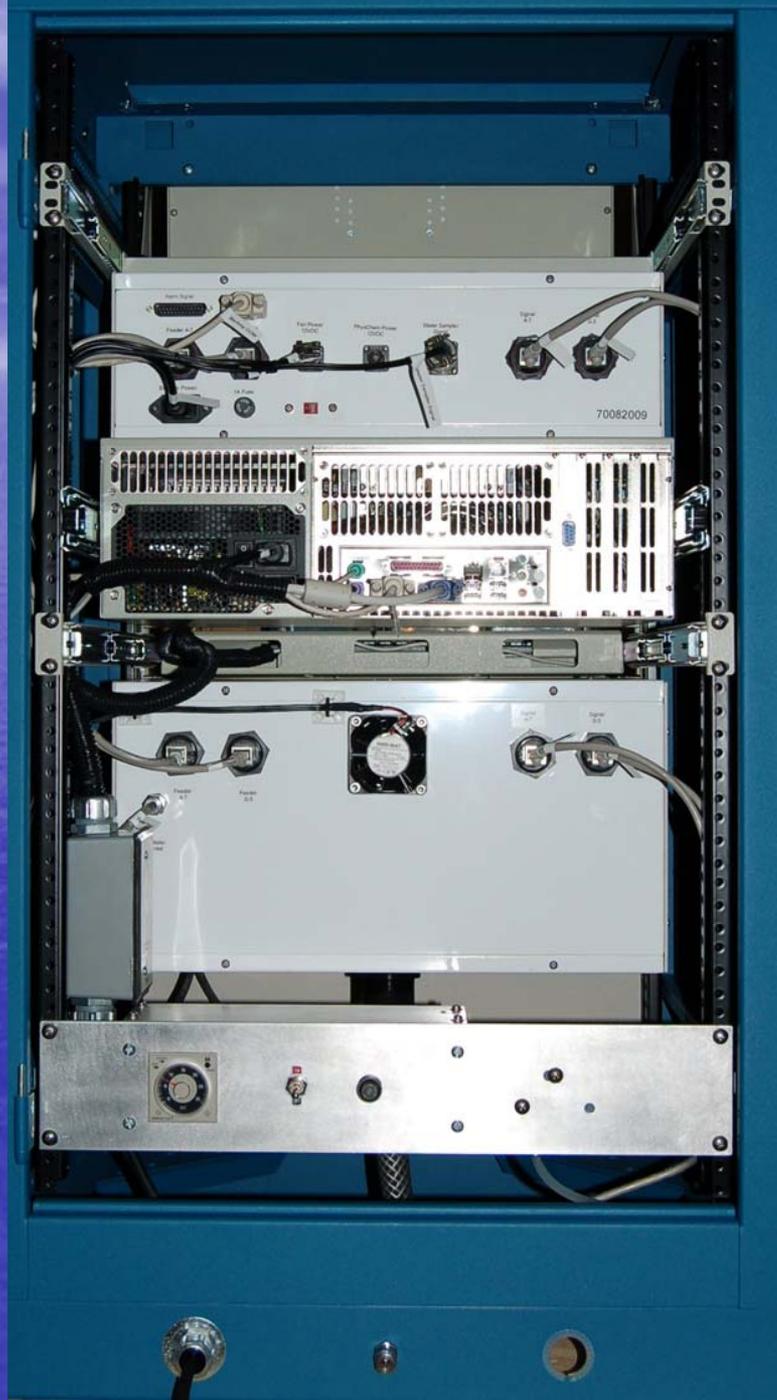
Signal 2

Fiber 1-2

Fiber 3-2

70
7/12/07





4
5

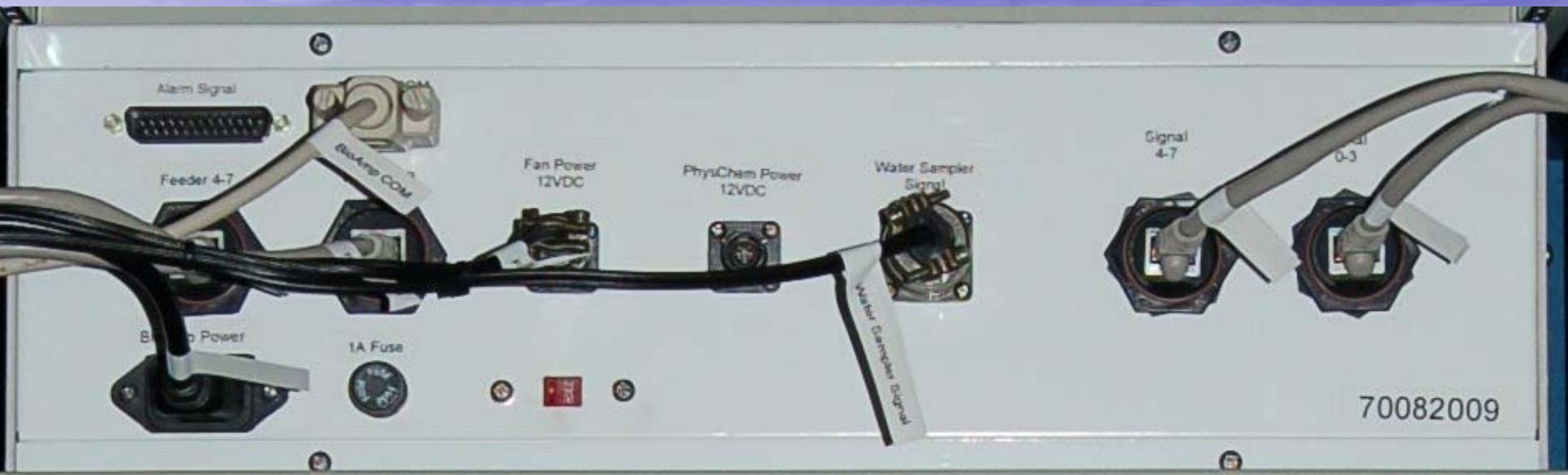
Main Signal
Probe A-1
Fast Power Monitor
Photo-Optic Sensor
Water Sample
Signal
70052009

1242

1242

Power 12V
Power 5V
Signal 12V
Signal 5V

1242



Alarm Signal

Feeder 4-7

Bump Power

1A Fuse

Fan Power
12VDC

PhysCham Power
12VDC

Water Sampler
Signal

Signal
4-7

Signal
0-3

70082009

Bio-Amp COM

Water Sampler Signal





Alarm Signal

Bio-Amp COM

Feeder 0-3

Fan Power

PhysChem Power
12VDC

Water Sensor

Water Sensor Signal

Signal
4-7

Signal
0-3

1A Fuse

ON/OFF

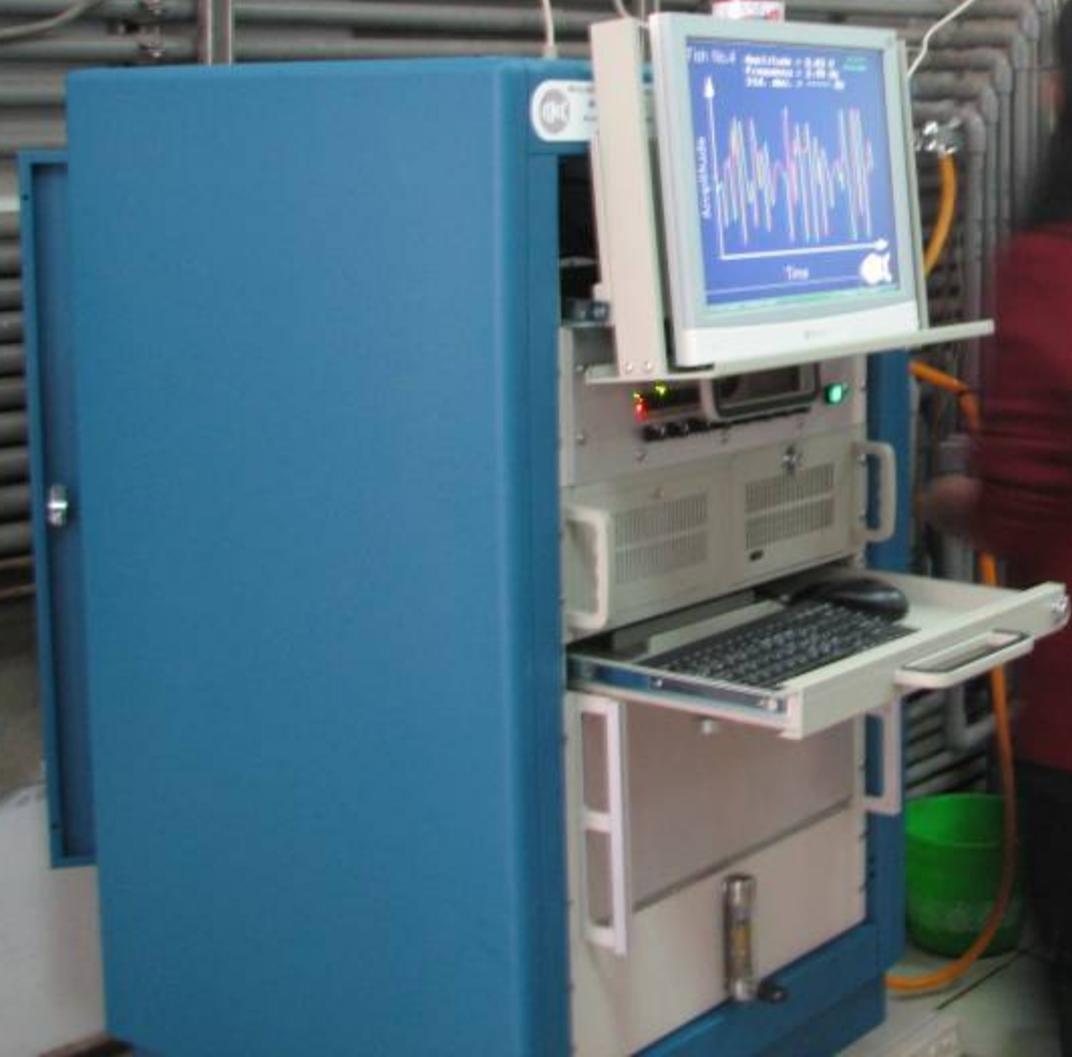
70082009



Signal
4-7

Signal
0-3





The image shows a laboratory setup with a large glass column mounted on a metal frame. The column has volume markings at 50 and 75. Below the column, there is a complex arrangement of glassware, including a large beaker and various tubes. To the right, there is a control panel with two digital displays and several buttons. The entire setup is connected to a network of pipes and hoses.



BioSensor[®]

Model 7008 Version 7.02y6

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Biological Monitoring, Inc.

Blacksburg, VA 24060 USA

(540) 953-2821



AD DATA DISPLAY

Ch 1 Ch 5

Ch 2 Ch 6

Ch 3 Ch 7

Ch 4 Ch 8

PACKET CONTROL

START

STOP

FEEDER PRIMING

PRIME

RELAY CONTROL

- Bio Alarm
- Flow
- Phys. Alarm
- Bell Alarm

Note: Digital Out Command is sent with each click.

BIOAMP PARAMETERS

ADC0 S.A.R. Clock Period (1-32): ? (READ)

ADC0 Gain: ? (READ) ▾

DAC0 Fine Adjust: ? (READ) ▾

Status code (0 = No Error): ? (Click READ)

UART1 Baud Rate (Auxilliary for future use) ? (READ) ▾

Disable Internal Beeper

UNIT SERIAL #

Get Unit Serial

MESSAGES

Clear Messages

[Empty message display area with scroll bar]

BUFFER STATUS

Bytes 0

Head 0

Tail 0

AUTOMATIC FISH FEEDER

Screw On Time (2 - 10 seconds): ? (READ)

Interval: (10 - 65535 seconds) ? (READ)

READ WRITE HELP



LOG INFORMATION

Today's date:

01/16/2007

Time of day:

13:06

Monitor Period Name:

OP011607

Bio-Sensor Setup

Start Fish Monitoring

End Program

Free disk space:

113 years.

9 months.

11 days.

17 hours.

19 minutes

Bio-Sensor®

Choose desired option with the
mouse or the arrow keys



SETUP MENU

Biological Alarm Sensitivity 

Physicochemical Sensors

Waveform Processing Parameters

Channel Assignments

Miscellaneous Options

Done

Bio-Sensor[®]

Choose desired option with the
mouse or the arrow keys



CHANNEL ASSIGNMENTS

Fish No.

0	Active	Reference	Inactive
1	Active	Reference	Inactive
2	Active	Reference	Inactive
3	Active	Reference	Inactive
4	Active	Reference	Inactive
5	Active	Reference	Inactive
6	Active	Reference	Inactive
7	Active	Reference	Inactive
Temperature	Active	Inactive	
Dissolved O2	Active	Inactive	
pH	Active	Inactive	
Conductivity	Active	Inactive	
Turbidity	Active	Inactive	
	Done		

Bio-Sensor®

Choose desired option with the mouse or the arrow keys



LOG INFORMATION

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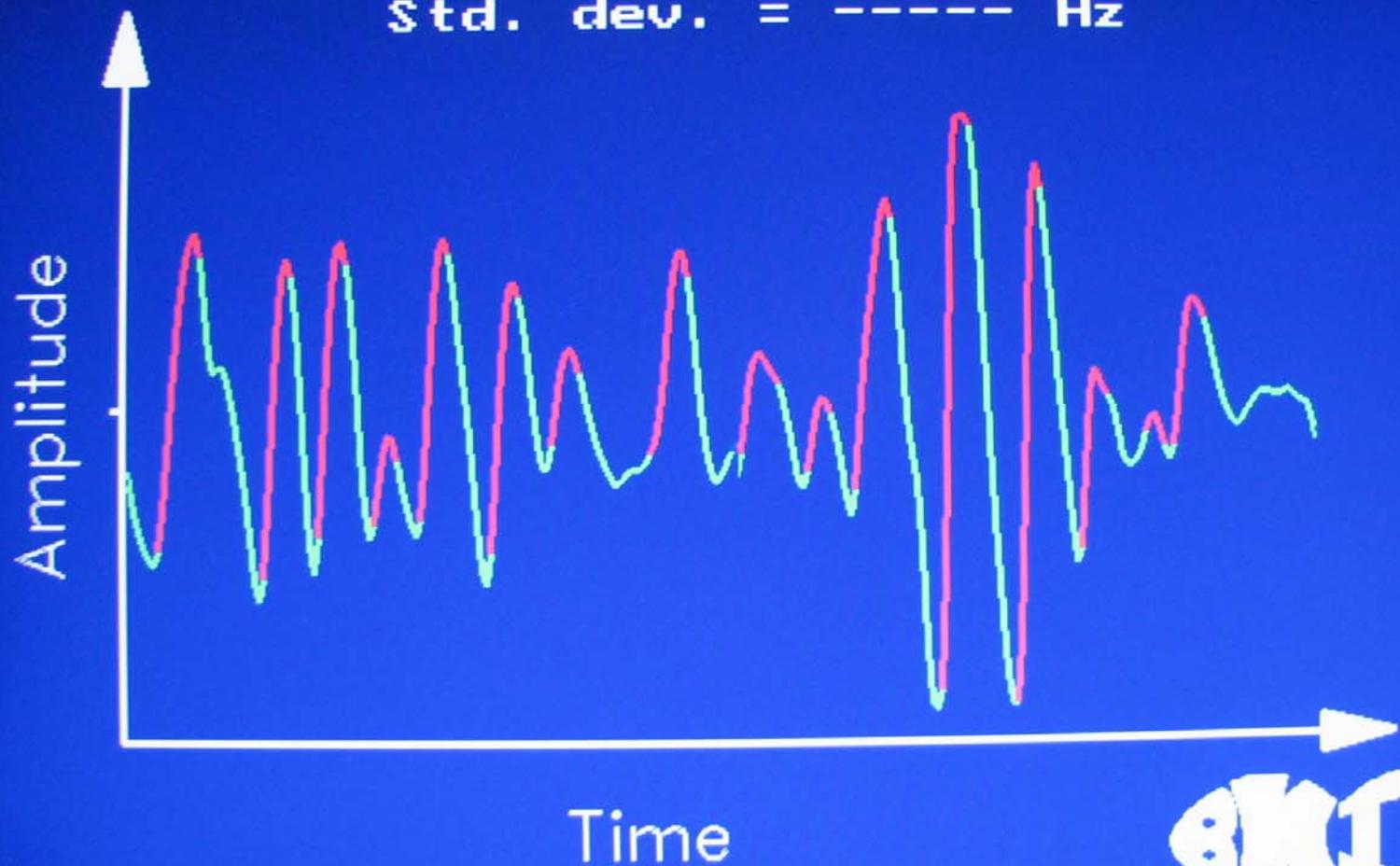




Fish No.4

Amplitude = 0.76 V
Frequency = 1.28 Hz
Std. dev. = ----- Hz

11:32:36
01/18/2007



Check P-CHEM monitor power, cables or configuration.

F2-Estimate F4-Move data

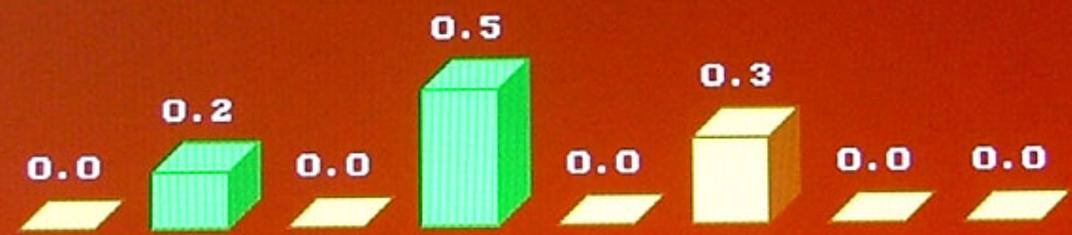
F4-Change Esc-Quit



GENERAL STATUS

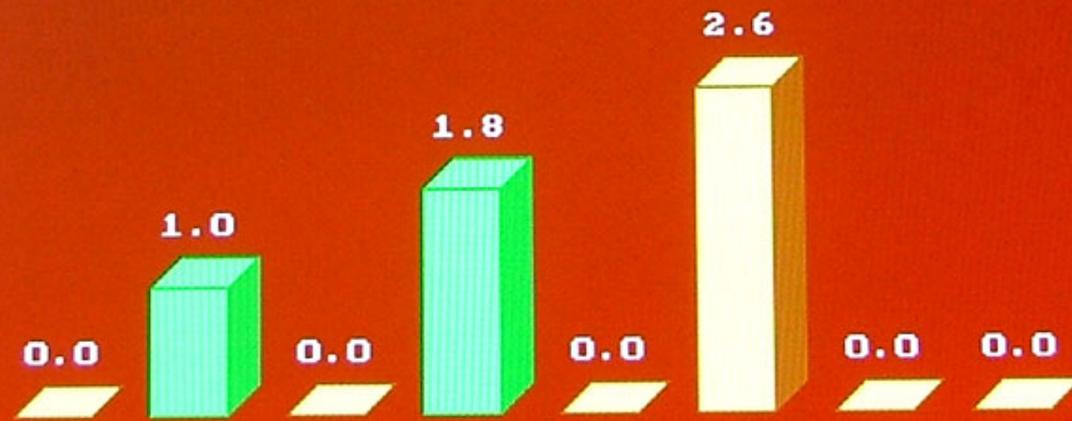
11:00:22
01/19/2007

Amp.
[V]



P-CHEM
Disconnected

Freq.
[Hz]



Fish No. 0 1 2 3 4 5 6 7

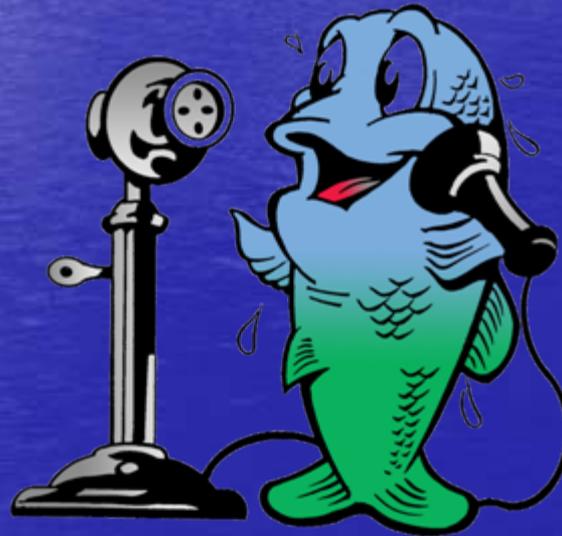
P-CHEM Monitor is disconnected

BIOSENSOR® DATA SUMMARY

- Over 50 Chemicals Tested
- Approximately 10 Different Waste Waters
- Over 40 Different Species
 - Majority = 7 Different Species
 - Species Selection: *c.f.* Sensitivity Vs Availability
- Acute Toxicants - Response Time < 10 Minutes
- Chronic Toxicant - Response Time = Dose Dependent
 - LOEC = 1 – 4+ h

WHAT THESE FISH KNOW MAY HURT YOU!

Can a Fish



Make a Phone Call?

CONTACT INFORMATION

Dr. David Gruber
Biological Monitoring, Inc.
1800 Kraft Drive
Blacksburg, Virginia, USA 24060

540-953-2821

www.biomon.com

dgruber@biomon.com