Minimate Pro™
Operator Manual

Instantel

Instantel®

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Canadian Customers:**

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808 Commerce Park Drive
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Toll free:	1-800-267-9111
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Customer Support

Instantel is represented by a network of qualified dealers throughout the United States, Canada, and Internationally. For further information, including product literature and the location of the dealer nearest you, contact **Instantel**.

- Extensive dealer network.
- Comprehensive application support.
- In–depth user documentation.
- Technical support, 1–613–592–4642 or e-mail service@instantel.com

Warranty

All Instantel products come with a one-year warranty. Series IV monitors, Minimate Pro4 and Minimate Pro6, and sensors will have the warranty extended for a second year if they are returned to the Instantel factory for service and calibration within 30 days of the 'Next Calibration' date printed on the calibration label located on the product.

If within a period of one year from the date of shipment to a customer the instrument fails to perform in accordance with Instantel's published specifications and the operator's manual, due to a defect in materials or workmanship, it will be repaired or replaced at **Instantel's** option, free of charge. This warranty is void if the equipment has been dismantled, altered or abused in any way. This warranty is nontransferable.

The above warranty does not include any implied warranty of functionality for a particular purpose. Instantel assumes no responsibility for damages of any description resulting from the operation or use of its products. Since it is impossible to anticipate all of the conditions under which its products will be used either by themselves or in conjunction with other products, **Instantel** cannot accept responsibility for the results unless it has entered into a contract for services which clearly define such an extension of responsibility and liability.

Any shipments returned directly to Instantel Inc. must have our prior approval and all packages must display the Return of Material Authorization (RMA) Number issued by Instantel. Shipping charges to Instantel's plant will be paid by the customer and those for return to the customer will be paid by Instantel.

To protect your warranty, you must complete and return a Warranty Registration Certificate, or complete the online Warranty Registration Form, within ten days of purchase. Units will be assumed out of warranty if there is no warranty card on file at Instantel. Retain this portion and the proof of purchase for your records.

Warning

This is an electronic instrument. Although it has been designed for field use, it contains sensitive components which cannot be expected to withstand the same stress and shock as heavy machinery. It contains a microcomputer and solid state memory, both of which may be made inoperative by severe radio interference. The use of transmitting equipment in the immediate vicinity of the unit should be avoided. Evidence of negligence in the care or handling of the instrument may void the manufacturer's warranty. This product contains no serviceable parts. The battery is not intended to be replaced by the operator. The unit should be returned to an authorized Instantel service center for service. Any attempt to service this product will void any and all warranties offered by Instantel. Service enquiries should be made via your dealer.

CE EC Warning

This is a Class B product. If this product is not used as outlined within this manual, it may cause radio interference.

Table of Contents

1. BEFORE YOU BEGIN

Before you begin using your new Series IV vibration and overpressure monitor, please complete the following. It ensures your monitor is ready for operation and that you become part of Instantel's Product Support Program.

Install the THOR or Blastware software then read the important information in the ReadMe file. See the Operator Manual for the software for installation instructions. For most monitoring operations, setting up and using the monitor is the same for both 4-Channel and 6-Channel models, Minimate Pro4™ and Minimate Pro6™. Where differences do occur, this manual specifies both the four and six channel procedures.

1.1. Check the Package Contents

Please check that you received all the parts identified on your shipping invoice. Remember to keep your shipping box because it was designed to safely ship your monitor back to Instantel for calibration and service.

1.2. Record the Minimate Pro Identification Numbers

Record the following identification numbers for future reference:

IDENTIFICATION NUMBERS	
Model Number	
Monitor Serial Number	
Monitor Software Version Number	
ISEE Geophone Serial Number(s)	
DIN Geophone Serial Number(s)	
ISEE Linear Microphone Serial Number	
Dealer Name	
Date Purchased	

1.3. Complete and Return Your Registration Card

Instantel offers the most comprehensive Product Support Program available. You receive a two year warranty, product support, and product updates. Your monitor and sensors must be returned to Instantel for annual calibration and servicing to maintain your second year warranty. You also receive free software upgrades for your Minimate Pro monitor and the accompanying software programs for the first year. All you have to do is complete the registration card included with your Minimate Pro and return it to Instantel by mail or facsimile within thirty (30) days of purchasing your new monitor. You may also register your product online at: http://www.instantel.com/servicecalibration/warranty.aspx.

1.4. Check Your Local Electric Power Supply

Every Minimate Pro comes with a 120 VAC, 60 Hz, 16W input AC adapter providing 12 VDC, 1.5A output. An optional 220 VAC adapter is available. Check with your local power utility to ensure the supplied electric power may be used with the Minimate Pro. Ask your dealer for information on an optional AC adapter to meet your local requirements.

Note to our customers in India and other countries:

Due to large power fluctuations found in countries including India, please use a voltage stabilizer and a 220 V AC Adapter to provide 10 − 14 VDC @ 1.5 A maximum to power the monitor.

1.5.   Waste Electrical and Electronic Equipment Directive

For EU countries, this product must be collected and discarded separately from household waste. In an effort to be as gentle as possible on the environment, Instantel has embraced the Waste Electrical and Electronic Equipment Directive (WEEE). This product contains electrical or electronic materials, including batteries. The presence of these materials will have adverse effects on the environment and human health if not disposed of properly. The WEEE label on the product means it should not be disposed of as unsorted waste and must be collected separately from household waste, as per legislation under the WEEE Directive. Below is the WEEE image, which appears on the Condensed Instructions label on each unit.

As a consumer, you are responsible for ensuring that this product is disposed of properly. To find out how to properly dispose of this product, please contact the Instantel Technical Services Department at 1-613-592-4642 or by e-mail, service@instantel.com.

2.   BATTERY AND MEMORY OVERVIEW

WARNING: The batteries are not intended to be replaced by the operator, and must only be replaced by an **Authorized Instantel Repair Facility**. The unit should be returned to an authorized Instantel service center for service. Any attempt to service this product will void any and all warranties offered by Instantel. Service enquiries should be made via your dealer.

The battery used in this device may present a fire or chemical burn hazard if mistreated. Do not disassemble or heat above 100°C (212°F) or incinerate.

2.1.   Activating the Battery

If you have received your Minimate Pro directly from Instantel, or from an Authorized Instantel Service and Calibration Facility, the battery will be deactivated for shipping safety and battery life conservation. Turn the battery on for use or charging by simply plugging in the provided AC Adapter to the unit and an electrical outlet, and pressing the **On/Off** key. If you are in the field or have forgotten your AC Adapter at the office, turn on the unit by pressing the **Up Arrow** and **Enter** keys simultaneously for approximately three seconds, and then press the **On/Off** key while still holding the other two keys.
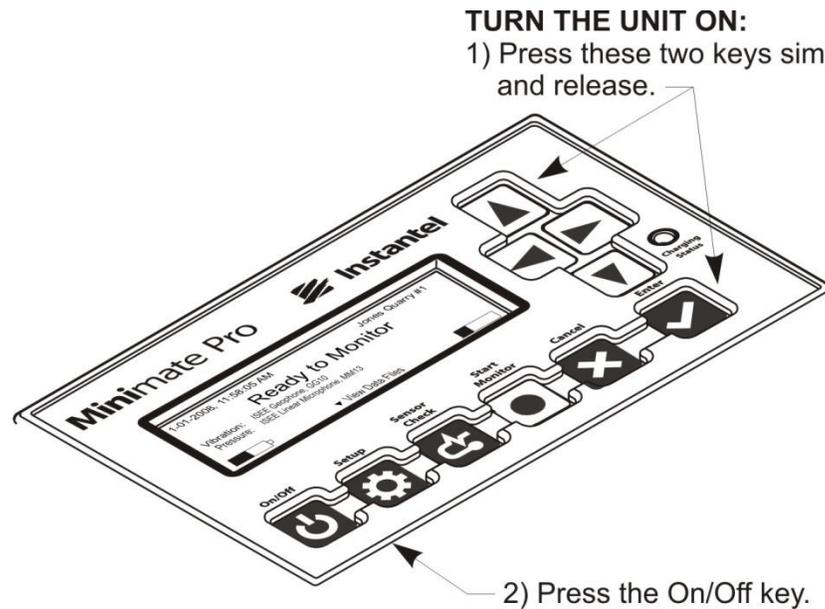
NOTE: A **Charging Status** LED is located next to the **Down Arrow** key and indicates the following:

1. **The light is not on** – The charger is not connected to a power outlet, or the charger is malfunctioning.

2. **The light is yellow** – The charger is connected to a power outlet and is charging.

3. **The light is green** – The batteries are fully charged.

4. **The light is flashing red/yellow** – The power source is not sufficient (i.e. battery, solar panel, or malfunctioning charger).

2.1.1.   Minimate Pro Startup

When the Minimate Pro is turned on, several information screens are displayed, as shown below:

(1) The Minimate Pro initially displays the Instantel logo, followed by the Minimate Pro software version and date of release.
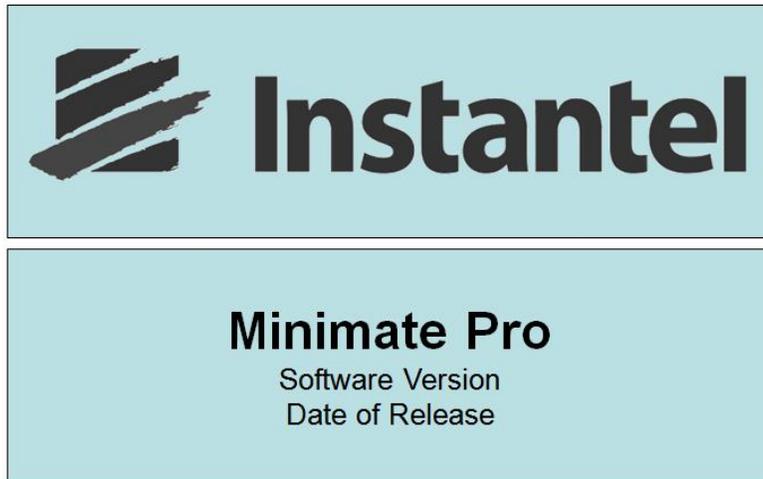
(2) The unit then displays the results of a File System Check diagnostic tool. This is the same File System Check that is run in the Maintenance menu, Self Check (see Section 9.6.5) option.

The unit will prompt to repair any errors found during the File System Check. If this is the case, accept the disclaimer notice and follow the prompts, or wait 30 seconds and the unit will continue to load the software configuration without applying any changes.

The sample series of displays below indicates that there were no errors found, and the unit automatically begins loading the software configuration.

(3) The next screen displayed shows the Battery Level and Available memory, followed by the number of Events and how much disk space is being used in size and percentage. The final screen indicates that the Minimate Pro is Ready to Monitor.

Battery Level: 100%
Available Memory: 60%

Events: 2(3.0MB 4%)

12/15/2008 12:24:05 PM   Factory
Ready to Monitor
Vibration: ISEE Triaxial Geophone, SE12551
Pressure: ISEE Linear Microphone, SL12552

▼ View Data Files
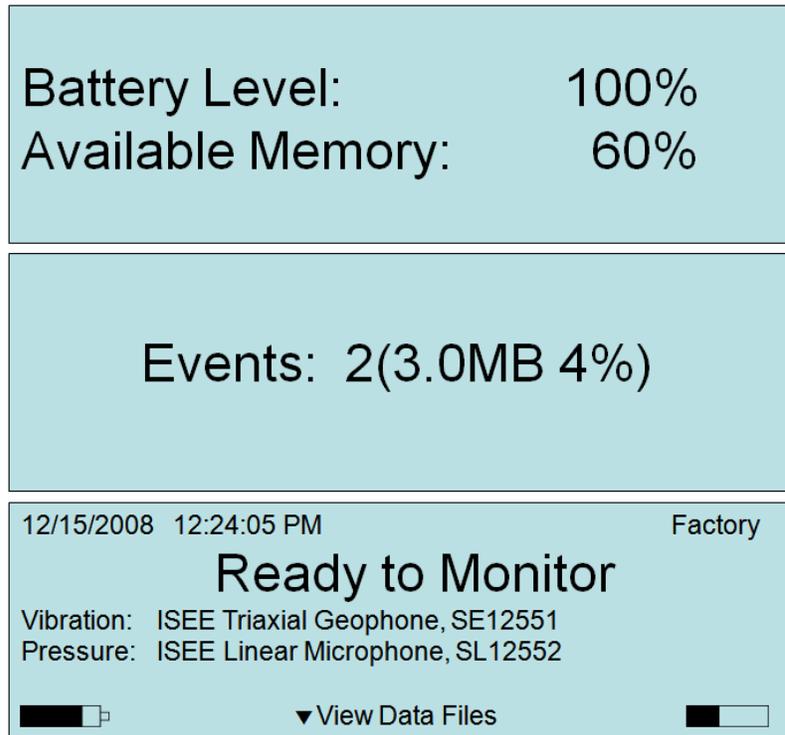
2.2.   Check the Memory and Battery Status

Always check the Memory and Battery status levels prior to recording Events or locating the monitor in the field. The Startup Window displays the amount of memory and the battery level. Memory and Battery icons are also located at the lower part of the main display window, which are visible once the unit has started.

The Memory icon displays increments of 25 percent of the total memory, with the black bar increasing as the memory is used.

As well, the Battery icon displays the level of the battery in increments of 25 percent of total capacity, with the black bar decreasing as the battery level is depleted.

10/15/2008 12:24:05 PM   Factory
Ready to Monitor
Vibration: ISEE Triaxial Geophone, SE12551
Pressure: ISEE Linear Microphone, SL12552

Memory
▼ View Data Files

BATTERY LEVEL   **MEMORY LEVEL**
INDICATOR   **INDICATOR**
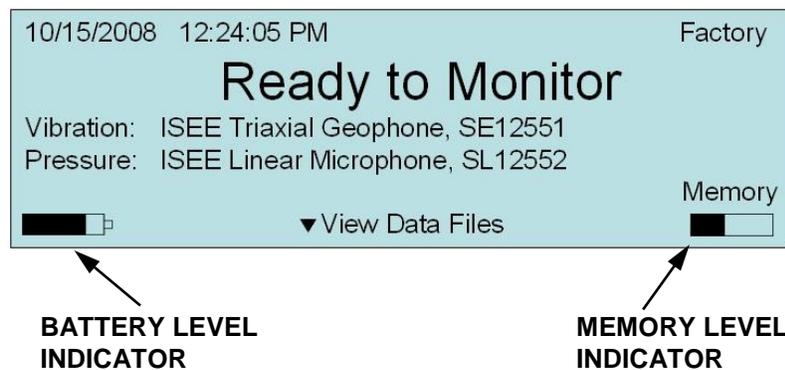
For accurate text readouts of the Memory and Battery levels, follow the directions below to access the About feature under the Maintenance menu:

1. Select the **Setup** key on the unit to access the main setup selection menu. Use **Down Arrow** key and highlight the Maintenance Menu item. Press the **Enter** key to select Maintenance Menu.
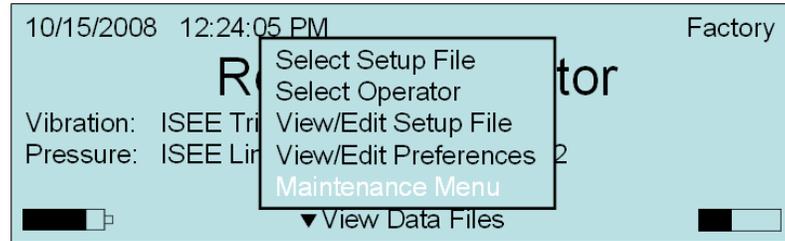
2. Press the **Up** or **Down Arrow** keys on the unit to highlight Next/Prev Setup Maintenance Menu options. Press the **Right Arrow** key to Action a Maintenance Menu option. At any time, press the **Cancel** key to return to the previous screen.

   a. About

   The **About** command opens a new screen that displays the following information:

   Model and Serial Number

   Firmware Release Number and Date

   Calibration Date

   Free Memory

   Battery Percent

   (1)   Press the **Right Arrow** key to select the **About** command.

   (2)   Press the **Enter** key to return to the Maintenance menu.

2.3.   Battery Instructions

2.3.1. Charging

The Minimate Pro internal battery requires regular and periodic charging.

To charge the battery, plug the supplied AC adapter into the connector labeled **Power**, located on the right hand side of the unit. Plug the other end into an electrical outlet. The battery charging indicator light turns on.

Instantel recommends using the 12V, 1.0A AC adapter supplied with each unit, with the description of the maximum adapter as shown on the **Power** connector label:
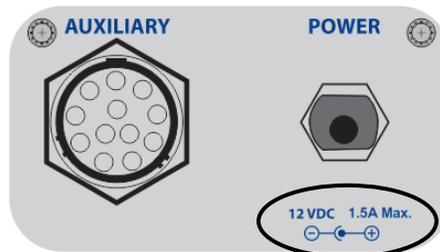
When storing the instrument for long periods of time, ensure that you charge the battery for at least 24 hours and then use the **Disconnect Battery** command within the Maintenance Menu.

NOTE: Use of AC adapters that exceed the maximum voltage and current specifications may cause undue stress on the monitor's internal regulators. Like all electronic devices, exceeding

these specifications increases the risk of damage and possibly of an accidental fire. The Instantel Warranty does not cover this type of damage.

2.3.2. Battery Life

The Minimate Pro battery life depends on current draw, aggregate sample rate, battery longevity, and ambient temperature. Review the following information to determine an estimate for battery life.

The nominal battery life for a Minimate Pro unit running in monitor mode is 10 days, at a sample rate of 1024, when in an environment of 25°C (77°F). If the ambient temperature drops to −20°C (−4°F) the battery capacity will also drop to approximately 80 percent or 8 days. At −40°C (−40°F) the capacity is approximately 50 percent.

Record Mode	Number of Recording Days at		
	25°C (77°F)	−20°C (−4°F)	−40°C (−40°F)
Waveform	10	8	5
Histogram	3.2	2.5	1.6

The nominal life expectancy of the battery (>70 percent of initial capacity) is >300 cycles. Li Ion batteries do not experience a memory problem if left on charge all the time. The typical charge retention (>80 percent of initial charge) is approximately 3 months over a temperature range −20°C (77°F) to 45°C (113°F).

NOTE: Depending upon activity on the Ethernet connection the number of record days could be reduced by 50 percent. We recommend connecting a unit to the supplied AC adapter or an external 12 VDC power supply for Histogram and Histogram Combo Record Modes.

LOW TEMPERATURE WARNING:
The internal batteries will not be charged if the ambient temperature is below 0°C (32°F) or above 45°C (113° F). However, the unit will continue to operate, drawing power from either the internal battery or the external power source, whichever is higher. As a consequence of this, if the unit is operated below 0°C (32°F) for an extended period of time, the batteries may eventually become depleted, and the unit will be totally reliant on the external power source.

Notes:

Minimate Pro Operator Manual

3. HANDLING PRECAUTIONS

- **Handle All Equipment and Accessories with Care**

- **Damaged Equipment**
  Do not operate the equipment if it has been significantly dropped or the casing is damaged. Immediately turn the instrument off and have an **Authorized Instantel Repair Facility** inspect it for possible damage. Do not use the AC Adapter if it is damaged or not fully inserted into the power outlet.

- **Use a proper AC Adapter**
  Use only the recommended Instantel AC Adapter. Use of alternate power sources not recommended for this instrument may incorrectly set polarity, cause overheating and/or distortion, fire, electrical shock, or other hazards.

- **Use a proper Electrical Outlet**
  Ensure that the AC Adapter is plugged into a properly rated power outlet. The plug of the AC Adapter varies according to country or region.

- **Do not expose the Adapter or Connector to Foreign Objects**
  Do not allow metal objects or dirt to contact the AC Adapter terminal or the plug. Ensure that the plug is clean prior to each use.

- **Keep the Minimate Pro On Charge**
  Always charge the battery when fewer than two graph bars appears in the display or immediately when the Minimate Pro beeps. If possible, when not in use, keep the Minimate Pro on charge. Instantel's supplied charger protects the battery from overcharging.

- **Disconnect the Battery if Storing or Shipping the Minimate Pro**
  If storing for prolonged periods of time, or shipping for calibration or service, disconnect the battery by using the Maintenance menu **Disconnect Battery** option – there is no requirement to open the Minimate Pro.

- **Always Hold a Cable by its Connector**

  Do not hold the cord to pull on a connector when connecting or disconnecting it.

- **Never Force a Connector**
  Always align the connector to the port before inserting. Ensure you are attaching the Sensor or Auxiliary to the proper connection.

- **Do Not Drop the Minimate Pro** or **Submerge it in Liquids**
  The Minimate Pro is rugged and designed to withstand normal wear and tear. The Minimate Pro is water-resistant, designed to withstand temporary exposure to water immersion. Intentionally immersing or installing the monitor in water for prolonged periods of time will damage the monitor.

- **Keep Computer Disks Away from the Geophones**
  The geophones contain magnets that could erase the data stored on computer disks.

Notes:

4. UNIT LABEL INSTRUCTIONS

4.1.   Condensed Instructions

Follow the Condensed Instructions, as shown below, and also displayed on the unit:

1. Connect the Geophone and/or Microphone sensors to the unit. Position the unit and sensor(s) at the desired locations.

2. Turn the unit on by pressing **On/Off** (Refer to Note A).

3. Check the **Battery Status** and **Memory** availability screen. Charge or use the supplied adaptor, as required.

4. When the Ready to Monitor screen appears, ensure that your sensor(s) are properly displayed (Refer to Note B).

5. To verify or edit Setups, press **Setup**. For additional setup information, refer to the **Minimate Operator Manual**.

6. Press **Start Monitor** to enter Monitoring Mode.

Note A:

If you have just received the unit, as a new product or from an **Authorized Instantel Service and Calibration Facility**, you must connect the battery by plugging in the Instantel AC adapter and pressing the **On/Off** key. You can also connect the battery by simultaneously holding down the **Up Arrow** and **Enter** keys for 3 seconds. While still holding down these keys, press the **On/Off** key.

Note B:

If you change your sensors, it is important to update the system after they are connected by pressing **Sensor Check**.

IMPORTANT:

7. Store the unit on charge when not in use for optimum battery performance.

8. Refer to *Chapter 8, Basic Tutorial*, for step-by-step instructions to begin monitoring with your Minimate Pro.

4.2.   Battery, Shipping and Warranty Instructions

Prior to shipping the unit to an Authorized Instantel Service and Calibration Facility, the battery must be disconnected by deactivating it through the Minimate Pro software interface. This is done through a series of key presses, and does not require that the unit be opened. Follow the steps below:

1. Press **Setup**.
2. Select the **Maintenance Menu**.
3. Select **Disconnect Battery** by pressing the **Right Arrow** key; the battery disconnects and the unit turns off.

WARNING: Only use the recommended Instantel AC Adapter to maintain optimum battery performance. This product contains no user-serviceable parts. The Operator is **NOT** to replace the battery. For additional information, refer to this manual.

Notes:

5. INTRODUCTION

The Minimate Pro™ offers advanced monitoring technology with unequaled versatility and flexibility to meet current needs and future requirements. As a smart device, your Minimate Pro can be programmed for new features as they are released by Instantel through either THOR or Blastware, the software companions for your monitor.

The Minimate Pro operates as a basic compliance monitor with intuitive functions and ease-of-use to help the first time operator setup and record an Event quickly. The Minimate Pro also offers advanced functions for specific applications requiring more information to be collected and analyzed.

5.1. Event Monitoring Example
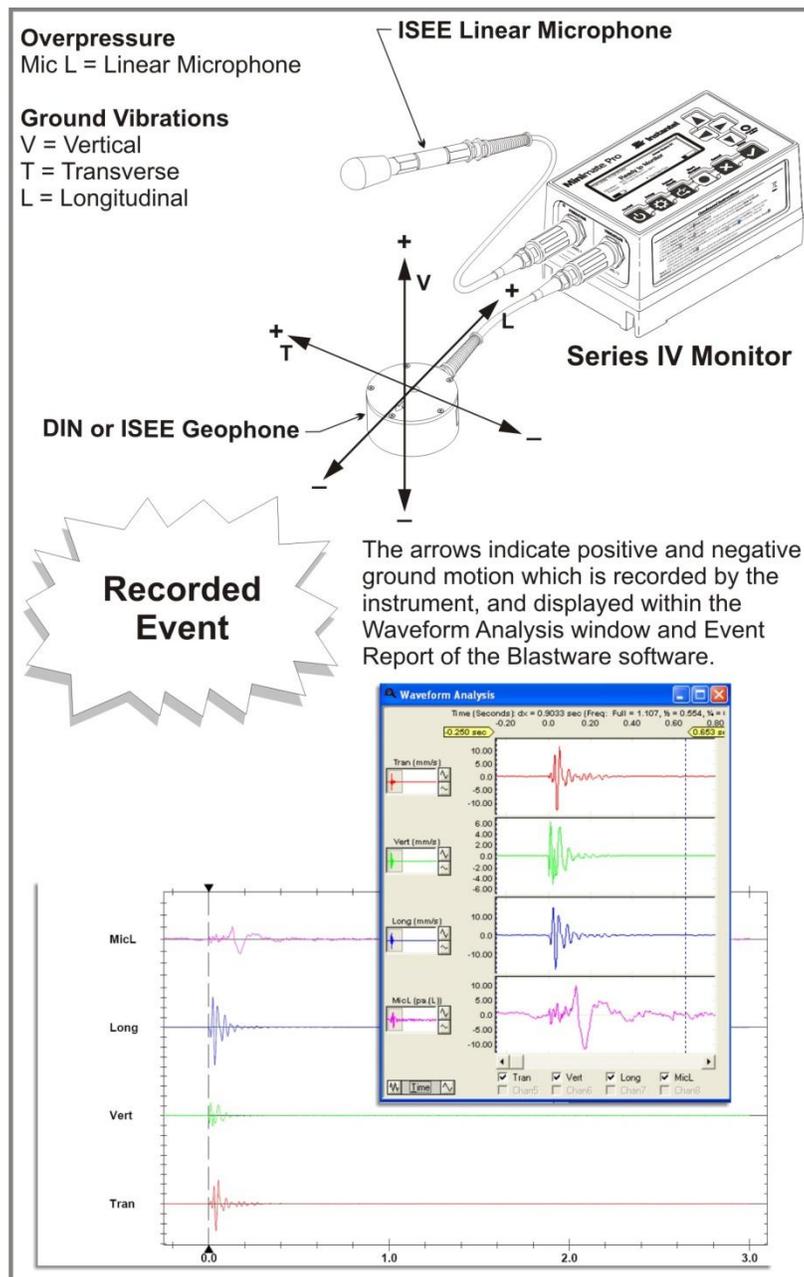
5.1.1. Suggested References

1. ISEE, International Society of Explosives Engineers   www.isee.org

2. EFEE, European Federation of Explosives Engineers members.efee-web.eu

3. FMGM, Field Measurement in GeoMechanics   www.fmgm.no

4. Vibrations from Blasting, by David E. Siskind, Ph.D.,
   published by ISEE, ISBN 1-892396-11-4

5. The Effects of Vibrations and Environmental Forces, by Lewis L. Oriard,
   published by ISEE, ISBN 1-892396-10-6

6. Construction Vibrations, by Charles H. Dowding, published by Prentice Hall,
   ISBN 0-13-299108-X

7. ISEE Blasters' Handbook, 17th Edition. Formerly ETI and DuPont Blasters'
   Handbook with 14 new chapters added. It can also be used as a study manual
   or blasting certificate examinations. ISBN1892396009

6. MINIMATE PRO4™ AND MINIMATE PRO6™ MODELS

The Instantel Series IV monitors include two models based on a specific number of recording channels. The Minimate Pro4 model offers four recording channels and can be set up with one Series IV Triaxial Geophone (ISEE or DIN) and an ISEE Linear Microphone. A second model, the Minimate Pro6, offers six recording channels with your choice of two geophones (ISEE or DIN) or a geophone (ISEE or DIN) and an ISEE Linear Microphone.

An example of each setup is shown below:

PRESSURE CHANNEL 4:
Attach ISEE Linear Microphone

NOTE:
DUST CAPS NOT SHOWN FOR CLARITY

VIBRATION CHANNEL 1-3:
Attach ISEE or DIN Geophone

Minimate Pro**4**

PRESSURE CHANNEL 4-6:
Attach ISEE Linear Microphone
OR
Geophone (ISEE or DIN)
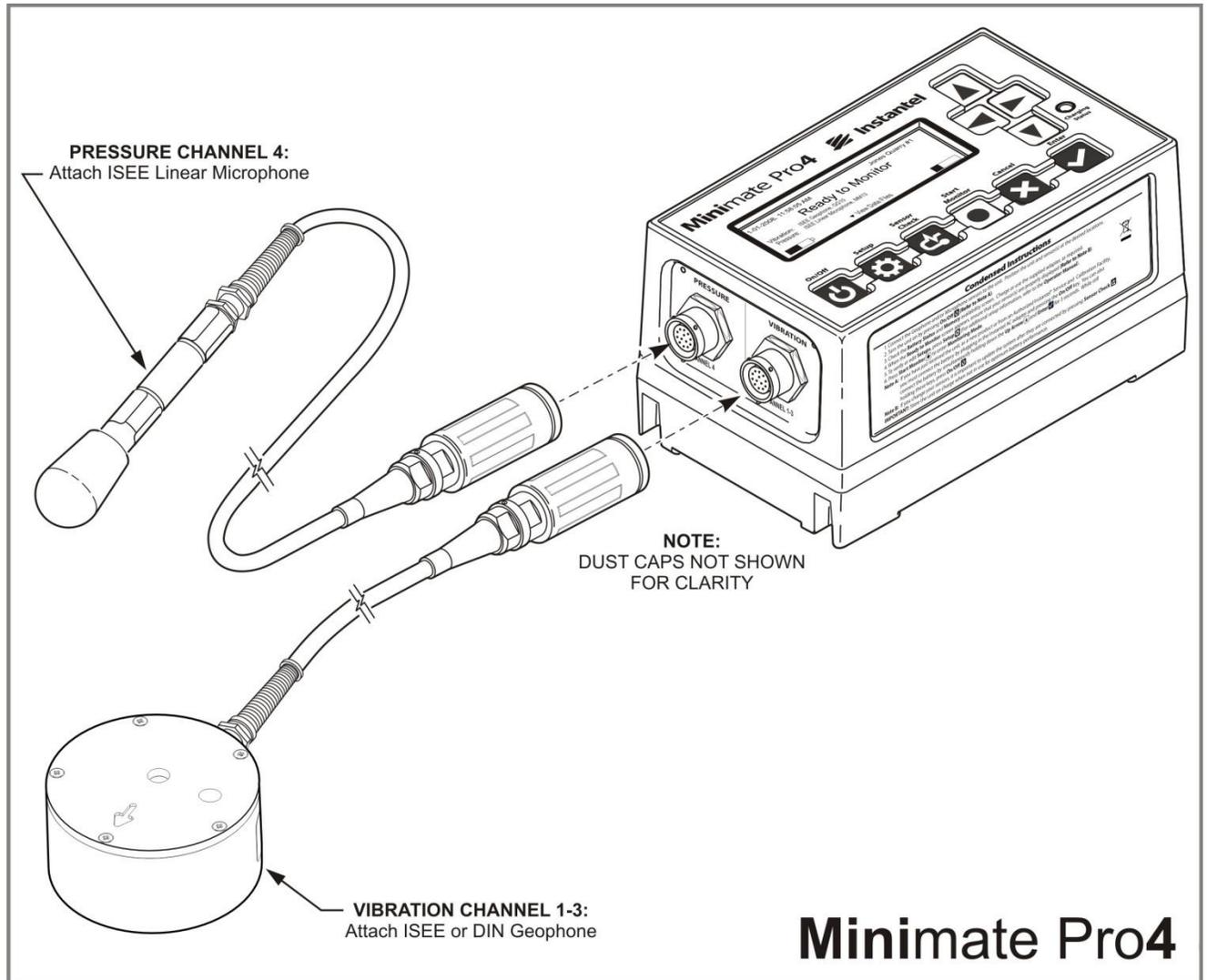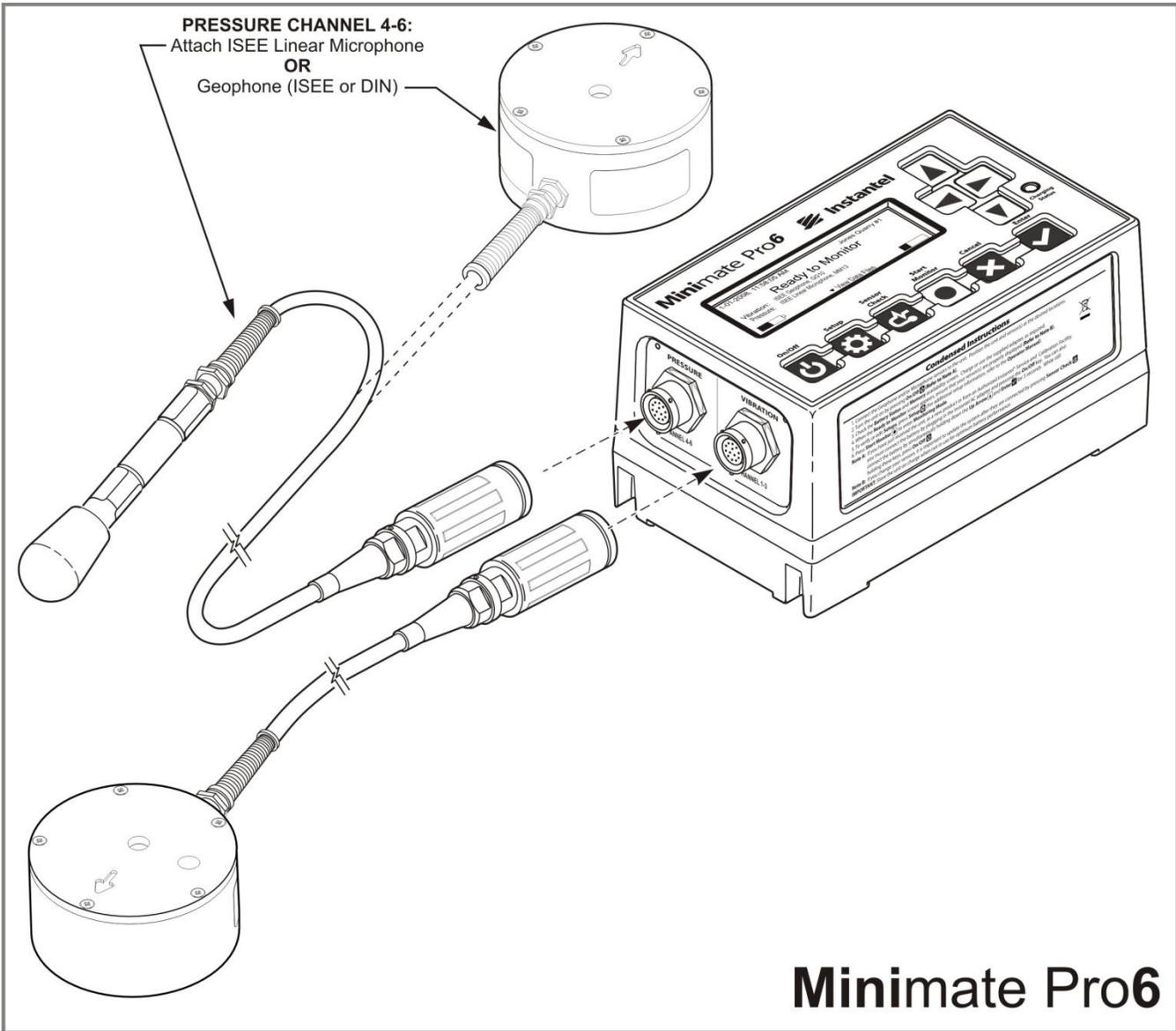
Minimate Pro**6**

6.1.   Minimate Pro4 and Minimate Pro6 Comparison

Series IV Instrument	Minimate Pro4	Minimate Pro6
Standard Features		
Number of Channels	4 Channels (ISEE or DIN Geophone, and an ISEE Linear Microphone)	6 Channels (ISEE or DIN Geophone on both connectors, or an ISEE or DIN Geophone and an ISEE Linear Microphone)
Recording Modes		
Waveform Manual	√	√
Waveform	√	√
Histogram	√	√

Histogram Combo		√	√
Sensors			
	ISEE Geophone	√	√
	DIN Geophone	√	√
	Linear Microphone	√	√
	2 Geophones or a Linear Microphone and a Geophone		√
Features			
	Sample Rates	512, 1024, 2048, and 4096 per channel	512, 1024, 2048, and 4096 per channel
	Memory	64MB	64MB
	Storage Capacity (1 sec. @ 1024 sps)	8000-plus 1 second Events at 1,024 S/s sample rate	7100-plus 1 second Events at 1,024 S/s sample rate with two geophones
	Water Resistant	√	√
	Monitor Log	√	√
	Zero Dead Time	√	√
	Monitor Scheduler	√	√
	Modem Support	√	√
	Auto Call Home™	√	√
	Ethernet Communications between unit and PC for downloading Events and unit setup.	√	√
Optional Features (Refer to the Chapter, Optional Features, in this manual for more information):			
	Vibration Dose Value (VDV) Monitor Mode (Requires THOR or Blastware Advanced Module)	Available	Available
	Wire Break/Make Trigger Cable	Available	Available
	Remote Alarm	Available	Available
	Series IV Remote Alarm/RS-232 Splitter Cable (for simultaneous use of a modem and an alarm)	Available	Available
	GPS (Recommended Garmin® eTrex® GPS)	Available	Available
	Ethernet Communications – Real Time Monitoring: view real time display of histogram data. (Requires THOR or Blastware Advanced Module)	Available	Available
	Series IV Class1 Sound Level Microphone	Available	Available

6.2. Minimate Pro Specifications

Vibration Monitoring: **ISEE/DIN Geophones**	Range	Up to 254 mm/s (10 in/s)
	Resolution	0.00788 mm/s (0.00031 in/s)
	Accuracy (ISEE/DIN)	+/− 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
	Transducer Density	2.13 g/cc (133 lbs/ft^3)
	Frequency Range (ISEE/DIN)	2 to 250 Hz, within zero to −3 dB of an ideal flat response / 1 to 315 Hz / 1 to 80 Hz
	Cable Length	Standard 1.83 m (6 ft), and the DIN Geophone supports custom lengths up to 1 km (0.6 mi).
	Frequency Analysis	National and Local Standards for all countries; refer to features and benefits
	Acceleration, Displacement	Calculated using entire waveform, not estimated at peak
	Trigger Levels	0.13 to 254 mm/s (0.005 to 10 in/s)
Air Overpressure Monitoring: **ISEE Linear Microphone**	Weighting Scales	ISEE Linear
	Range	88 to 148 dB (500 Pa [0.072 psi] Peak)
	Resolution	0.0155 pa (2.2662×10-6 psi)
	Accuracy	+/− 10% or +/− 1 dB, whichever is larger, between 4 and 125 Hz
	Frequency Response	2 to 250 Hz between −3 dB roll off points
	Trigger Levels	0.00002 – 0.0715 psi in steps of 0.00001 psi (100 – 148 dB)
Sampling Rate		512, 1,024, 2,048, 4,096, 8,192, 16,384, 32,768, 65,536 S/s per channel (independent of record time)
Event Storage – Minimate Pro4	Full Waveform Events	8,000-plus 1 second events at 1,024 S/s sample rate
Event Storage – Minimate Pro6	Full Waveform Events	7,100-plus 1 second events at 1,024 S/s sample rate with 2 geophones
Full Waveform Recording	Record Modes	Waveform Manual, Waveform, and programmed Start/Stop
	Record Time	1 to 9,000 seconds (programmable in one-second steps) plus a 0.25 seconds pre-trigger
	Auto Record™ Time	Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled
	Cycle Time	Recording uninterrupted by event processing, monitoring, or communication – no dead time
Histogram	Recording Interval	1 to 30 second intervals, and 30 seconds to 60 minutes at 30 second intervals
	Storage Capacity	800,000 intervals Example: 11.9 days at 2 second intervals, or 355 days at 1 min
Histogram Combo™	Storage Capacity	Example: 30 days of Histogram recording at 1 minute intervals, and over 6500 1 second waveform events
Special Functions	Monitor Scheduler	Programmed Start/Stop
	Scaled Distance	Weight and distance stored with event
	Monitor Log	History printout programmable up to all events stored
	Automatic download	Automatic and remote downloading of data from an unattended monitor with the **Auto Call Home™** feature
	Measurement Units	Metric or Imperial, dB or Linear Air Pressure
	Location	Log GPS (Global Positioning System) data into record
User interface	Keyboard	10 domed tactile with separate keys for common functions
	Display	7-line x 32-character, high-contrast, multi-color backlit LCD
Battery Life		10 Days
Dimensions	Length x Width x Height	22.23 cm (8.75 in) x 11.75 cm (4.625 in) x 10.80 cm (4.25 in)
Weight		2.3 kg (5 lbs)
Warranty	2 Years Parts and Labor	Calibration and equipment check required at 1 year to maintain additional 1 year of warranty

Environmental		**Ambient Operating Temperature Range**
	LCD	−20 to 45°C (−4 to 113°F)
	Electronics	−40 to 45°C (−40 to 113°F)
	Battery	−20 to 45°C (−4 to 113°F)
	ISEE Microphone	−20 to 50°C (−4 to 122°F)
	ISEE and DIN Geophone	−40 to 50°C (−40 to 122°F)
	Water Resistance	IPC67 – submerse to 30 cm (1 ft) for 24 hours
	CE Classification	CE Class B

NOTE: Product specifications are subject to change.

6.3. Minimate Pro Physical Attributes

Make additional copies of the image below. It may be used as a template for mounting the unit to a surface or within a security box for long-term or remote monitoring applications.

MASTER MOUNTING TEMPLATE
Please make additional copies, as required.

WEIGHT

Minimate Pro: 2.36 kg (5.2 lbs.)
Geophone: 0.91 kg (2 lbs.)
Microphone: 0.45 kg (1 lb.)

20.0 cm (7.88")

14.73 cm (5.80")

22.23 cm (8.75")

10.80 cm (4.25")

12.1 cm (4.76")

8.64 cm (3.40")

NOTE: If you are installing the unit in a secure box, add +13.97 cm (+5.5") for clearance on each side that cable connectors are to be used.
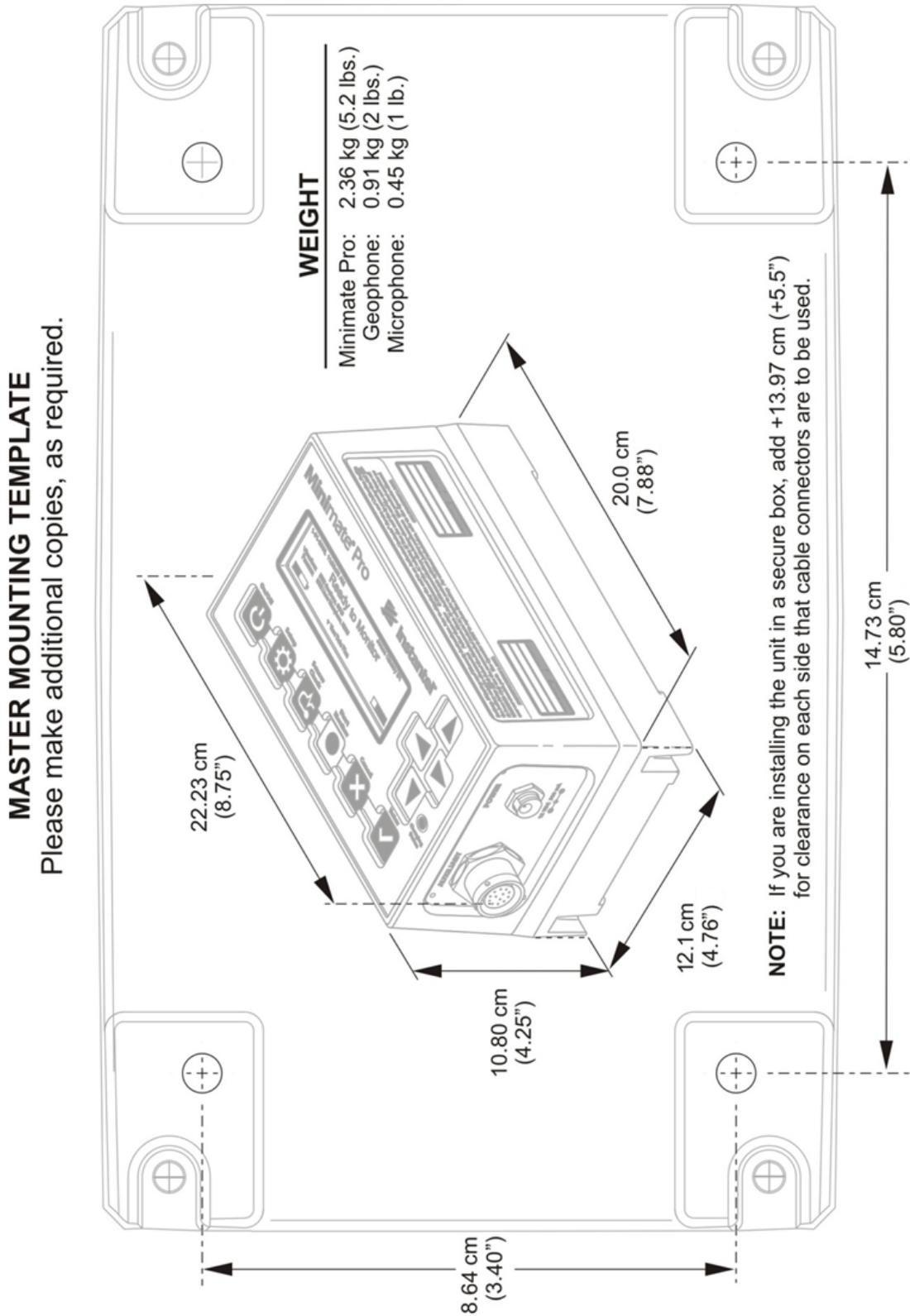
6.3.1. Features and Benefits

The Minimate Pro offers outstanding features unequaled in the industry. The following lists some of these features. Please see the specifications located in the Appendix of this manual for a complete list.

- **Two Year Warranty** – Full two year parts and labor warranty on the monitor. A calibration and equipment check at the one year mark is required to ensure continued reliable performance and the second year of the warranty.

- **Full Waveform Event Capacity** – For Minimate Pro4, 8000-plus 1 second Events at 1,024 S/s sample rate. For Minimate Pro6 with two geophones, 7100-plus 1 second Events at 1,024 S/s sample rate.

- **Personal and Job Specific Information** – Customize how your monitor works with saved **Setups**, **Notes**, **Name** and **Location** information.

- **Keypad** – Large 10-key interface helps you navigate through the simple menu structure. **Manual Record Mode** is at the tip of your finger, as are the **Setup** and **Sensor Check** features.

- **Large Backlit Display** – Large display and characters for easy reading; you choose the backlight color option and timeout settings for battery conservation.

- **Intuitive Interface** – Graphic icons keep you informed of battery and memory levels, and dynamic display of **Peak Vibration**, **Zero Crossing Frequency**, and **Peak Overpressure** in imperial or metric units keeps you informed as events occur.

- **Multiple Record Modes** – Offers you unlimited flexibility during monitoring operations with **Manual Waveform**, **Waveform**, **Histogram** and **Histogram Combo** with programmed start/stop recording options. Optional **Vibration Dose Value** (**VDV**) with THOR or the Blastware Advanced Module.

- **Full Waveform Event Analysis** – Full field analysis of the Event including **Peak Particle Velocity** (**PPV**), **Peak Air** (sound), **Pressure**, **Peak Vector Sum** (**PVS**), **Peak Acceleration**, and **Peak Displacement**. For any event, view **Operator**, **Trigger Levels**, **Duration**, **Max Vibration** and **Overpressure**, **ZC Frequency**, and **Sensor Check** information right on the monitor.

- **National Frequency Analysis Standards** – The Minimate Pro supports numerous Compliance Reports, also called National Frequency Analysis Standards. Two frequency standards, U.S.A. USBM/OSMRE and German DIN 4150, appear in the image below. Use the software to choose the Compliance Report used by the monitor.
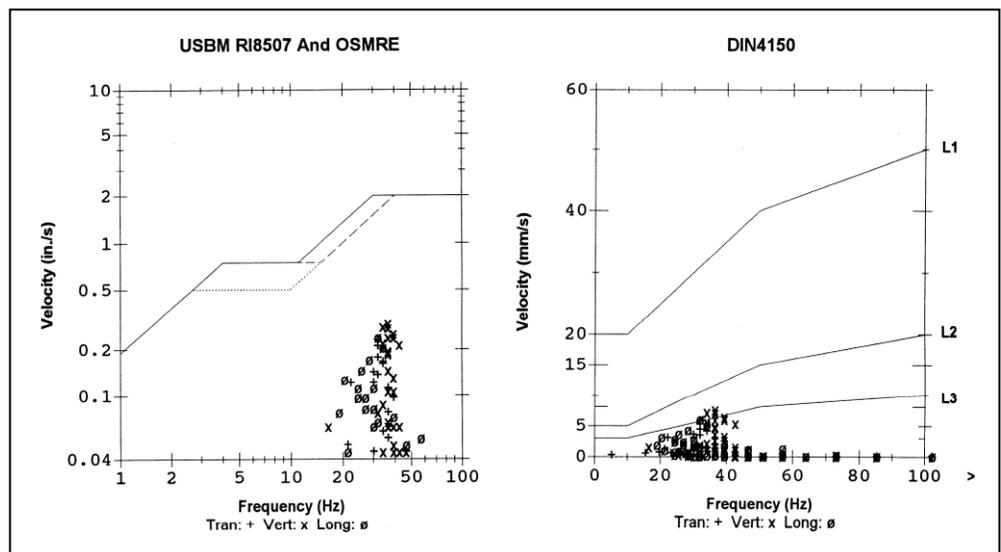
NOTE: Data points appearing outside of the report indicate the recorded data was outside the range of the report. In the DIN 4150 example, some peaks occurred at frequencies greater than 100 Hz and were therefore drawn outside the boundaries of the report.

A list of National Frequency Standards included with THOR or Blastware:

National Frequency Analysis Standards
Australian Standard – 2187.2-1993
Australian Standard – QLD APP Standard
British Standard – 6472: 1992 Curve 128
British Standard – 6472: 1992 Curve 16
British Standard – 6472: 1992 Curve 20
British Standard – 6472: 1992 Curve 32
British Standard – 6472: 1992 Curve 60
British Standard – 6472: 1992 Curve 8
British Standard – 6472: 1992 Curve 90
Czech Standard
Denmark Standard – Harmoniska Svangningar
European Standard – DIN4150
French – Ministere Environnement
French – Foction de Ponderation
Generic Graph – Add New Title
India – DGMS [A]
India – DGMS [B]
India – Bureau of Standards
Metric Response Spectrum
India – Proposed CMRI
New Zealand Standard – 4403:1976
New Zealand Standard / ISO – 2631-2-1989 Combined Curves
Slovak Standard
Spanish Standard– Criterio Prevencion 22.381
Swiss Standard – Mining Standard SN 640 312a
Swiss Standard – Piling Standard SN 640 312a
Swiss Standard – Traffic Standard SN 640 312a
USBM Standard – RI8507 and OSMRE

- **Ethernet Communications** – Download Event data from the unit. Upload setup files. View histogram data in real time with THOR or with the Blastware Advanced Module.

- **Remote Connectivity** – Use the Auto Call Home program for easy, remote access to your monitor and data, using Serial or IP communications. Whenever an event occurs, the monitor automatically places a call to your PC and downloads event data into a central location on your computer. When the monitor is ready to call in, it switches its modem on, and dials in to your PC. When communication has been established, the PC checks the serial number of the monitor, and then executes the instructions you have set for that specific monitor. Once data has been downloaded, the PC terminates communication.

  To use this feature, a telephone (cellular or satellite), modem connection to your Minimate Pro monitor, a PC equipped with a free serial port, and the Microsoft Windows operating system are required. For the Auto Call Home Serial Communications option, each communications port used on the PC must also have a modem. Please refer to the THOR or Blastware Operator Manual for more information on how to set up the Auto Call Home feature.

- **Wire Break/Make Trigger Cable** – Use the optional external wire **Break** or **Make** connected to the Auxiliary Connector to trigger the unit at the same time as the Event occurs or connect up to six units for a primary/secondary triggering configuration. Trigger within 1 sample (Example: 1 ms at 1024 or ¼ ms at 4096).

- **Full PC Compatibility** – Archive, print, perform analysis and processes with THOR or Blastware:

Processes	Tools
View History	Scaled Distance
Add	Post Event Notes
Subtract	ASCII Conversion
Shift	Human Exposure Report
Truncate	Compliance Graph Editor
Vector Sum	Language Editor
Integrate	Edit Timeline
Differentiate	Scale Graphs
Filter	Remove Channel
Scale	Ponderation
Remove Offset	Human Exposure
FFT Analysis	Transfer Function
Test Wave	Export Channel Data
Peak Hold	
Smooth	

- **Variable Sample Rates – 512**, **1024**, **2048**, and **4096 KHz** for each channel.

- **Minimate Pro6**™ – Offers the capability of two vibration recording points. This feature allows you to attach either an ISEE Microphone and a DIN or ISEE Geophone, or two DIN or ISEE Geophones.

- **Rugged Design** – Field rugged and durable design with a fully sealed top panel, non-corrosive industrial grade connectors, and sealed electronics to enhance water resistance. Series IV monitors offer an added level of EMI shielding, built-in noise and anti-aliasing filtering; both sensor ports are isolated from the ground.

6.4. Unit and Accessory List

Instantel's complete line of Minimate Pro units and related accessories:

Part No.	Item	Description
720A2301	**Minimate Pro4**	4-Channel Unit
720A2401	**Minimate Pro6**	6-Channel Unit
72300101	**THOR Monthly License**	Event Manager, reporting, and advanced analysis; monthly license
72300201	**THOR Yearly License**	Event Manager, reporting, and advanced analysis; yearly license
714A4501	**Blastware Advanced Module**	Event Manager, reporting, and advanced analysis
720A2001	ISEE Geophone	2 to 250 Hz frequency response. An additional Series IV ISEE Geophone may be purchased and used on the Pressure Channel, 4-6, of the Minimate Pro6.
720A2002	DIN Geophone	1 to 315 Hz frequency response. An additional

		Series IV DIN Geophone may be purchased and used on the Pressure Channel, 4-6, of the Minimate Pro6.
720A2003	DIN Geophone	1 to 80 Hz frequency response. An additional Series IV DIN Geophone may be purchased and used on the Pressure Channel, 4-6, of the Minimate Pro6.
720A1801	ISEE Linear Microphone	Linear "L" Microphone for air pressure measurements.
720A5101	Sound Level Microphone	Record unattended monitoring of noise, such as building activities, construction, traffic, and mining operations.
714A1801	ISEE Geophone Leveling Plate	With adjustable leveling feet and integrated bubble level. Used to mount the ISEE Geophone to a wall or ceiling as well as ground installations.
1712	Microphone Windscreen	Reduce false triggering caused by wind by installing the fitted foam covering over the microphone sensor.
714A3401	Microphone Stand Assembly	3-part threaded alloy stand for mounting and elevating the Linear Microphone.
720A3901	Remote Alarm Controller	The unit can trigger a local audible and/or visual alarm through the **Auxiliary I/O** port.
720A4001	**Series IV** Remote Alarm/ RS-232 Splitter Cable	Connect a Remote Alarm and Modem to the unit simultaneously.
720A3101	RS-232 Communication Cable	Connect a Series IV instrument to a 9-pin serial port on the PC.
71407001	USB Serial Adaptor Cable	Use a USB Adaptor to connect to the Serial communication cable and a USB port on the PC.
720A3501	Wire Break/Make Trigger Cable	Trigger up to six Minimate Pro units; a **Wire Break/Make Trigger Cable** is required for each unit to be triggered. The monitor's Auxiliary Channel senses the wire trigger signal via a 20 gauge **Make** or **Break** wire provided by the operator, and starts recording. Refer to the Chapter, Optional Accessories, this manual, for more information.
720A3301	**Series IV** Extension Cable, 30.5 m (100 ft.)	Series IV extension cable with connectors for ISEE and DIN Geophones, and ISEE Linear Microphone sensors.

720A3302	**Series IV** Extension Cable, 76.2 m (250 ft.)	Series IV extension cable with connectors for ISEE and DIN Geophones, and ISEE Linear Microphone sensors.
720A3305	**Series IV** Extension Cable, Custom Length	Must be purchased with connectors and assembly and a specific length of extension cable (Part No. 301-000034-000).
301-0000 34-000	**Series IV** Extension Cable, Custom Length	Up to 1 km (.62 mi) supported Series IV extension cable for the DIN Geophones. Must be purchased with connectors and assembly (Part No. 720A3305).
720A3801	**Series IV** Extension Cable, Connector Kit	Male and Female connectors only. Customer to supply and build cables
714A2401	Auto / 12 V Adapter	Connect the Minimate Pro to your vehicles 12 volt power supply or a 12 volt battery for remote installations.
370-000002-000	PS-12/1.0	12V, 1.0A AC. For use with Series IV units.
720A3601	Null Modem Cable	Cable for connecting a U.S. Robotics modem to a Series IV unit.
720A3401	Null Modem Cable	Cable for connecting a CDMA AirLink Raven modem to a Series IV unit.
720O2101	Accessory and Unit Carrying Case	Optional Carrying Case is available to protect and store your equipment during transfer and storage.
720A4101	Ethernet Communication Cable, **Minimate Pro** to PC	For Ethernet Communications

6.5. Unit Keypad and Menu Navigation Overview

Before starting the *Basic Tutorial, Chapter 8*, familiarize yourself with the following two Subsections, Unit Keypad Overview and Unit Menu Navigation.

6.5.1. Unit Keypad Overview

The display has a variety of commands used to navigate the menus, enter or edit data, or perform actions. Use the keys of the of the Minimate Pro to navigate through the menus, perform a **Sensor Check**, enter the **Setup** menu, and **Start Monitor** for manually recording events.

Key	Symbol	Associated Commands
On/Off		Turn the monitor display **On** or **Off**.
Setup		Access the Main Menu.
Sensor Check		Perform a **Sensor Check**.
Start Monitor		Manual start key to monitor an Event
Cancel		**Cancel**, Back, or Exit.
Enter		**Enter**, Save, Accept, Menu.
Up/Down Arrows		Next/Prev, Scroll through Menus, or Text Entry. Hold down to scroll quickly.
Right Arrow		Edit, Action, Add, Detail, or Text Entry.
Left Arrow		Navigate Text Fields
Down Arrow		Levels Off, View Data Files, Last Event
Key Combination		Use this sequence to connect the battery and turn the unit on without an AC Adapter

Status Light

A **Charging Status** LED is mounted next to the **Down Arrow** key and indicates the following:

1. **The light is not on** – The charger is not connected to a power outlet, or the charger is malfunctioning.

2. **The light is yellow** – The charger is connected to a power outlet and is charging.

3. **The light is green** – The batteries are fully charged.

4. **The light is flashing red/yellow** – The power source is not sufficient (i.e. battery, solar panel, or malfunctioning charger).

6.5.2. Unit Menu Navigation Overview

1. When the Minimate Pro is initially turned on, the following two screens appear after a few seconds:

> ### Minimate Pro
> Software Version
> Date of Release

> | Serial Number | Calibration Date | Software Version |
> |---|---|---|
>
> **Battery Level:**   100%
> **Available Memory:**   60%
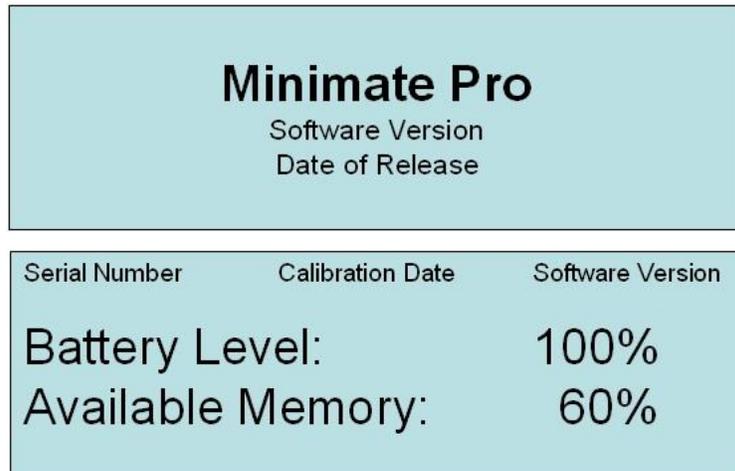
2. These two screens are followed by the **Main Display** Screen:

ACTIVE DISPLAY AREA: ATTACHED SENSORS, MONITORING DATA, OR LIST OF MENU ITEMS WHEN USING THE SETUP FUNCTION

DATE   TIME   STATUS OF UNIT OR COMMAND PROMPT   CURRENT SETUP FILE NAME

> 10/15/2008 12:24:05 PM   Factory
> ### Ready to Monitor
> Vibration: ISEE Triaxial Geophone, SE12551
> Pressure: ISEE Linear Microphone, SL12552
>   Memory
>   ▼ View Data Files

BATTERY LEVEL INDICATOR

CHANNELS:
Minimate Pro4 – Pressure
Minimate Pro6 – Pressure
         or **Vibration**

COMMANDS ASSOCIATED WITH KEYPAD ENTRIES

MEMORY LEVEL INDICATOR

3. Entering or editing text for items such as **Locations**, **Operators**, **Company** and **General Notes** are all performed within an editing screen. Press the **Up** or **Down Arrow** to scroll through the upper and lower case characters, numerical, and special characters. Press the **Right** and **Left Arrows** to move to and from each character location for editing. Press the **Enter** key to **Save** the changes, or the **Cancel** key to return to the previous menu without saving the changes.

4. Within the **View Data** window, each event that is recorded with a particular recording option, **Waveform** or **Histogram**, and has a different icon representing the data to help you determine the type of event:

```
   Date           Time        Setup                      1 of 8
  10/15/2008     10:12:49a    factory
  10/15/2008     10:14:19a    factory
  10/15/2008     12:17:09a    factory
  10/23/2008     02:33:15a    Reed Stone South Pit
  10/23/2008     02:35:15a    Reed Stone South Pit
         ▲ ▼ Next/Prev   ▶ Detail   ✔ Menu   ✖ Exit
```

**SYMBOL REPRESENTING A RECORDED WAVEFORM
OR A SOUND LEVEL MICROPHONE RECORDING**

a. Within the **View Data** window, select the **Right Arrow** key to display the **Detail** of a selected Waveform Event. Below is an example of the **Detail** feature for a Waveform Event:

```
 Event, 10/15/2008, 1:24:05 PM                     Factory
 Operator:              P. Jones
 Trigger:               Manual
 Duration:              1.0 sec, Fixed
 Maximum Vib:           62.0 mm/s, 37 Hz
 Maximum OP:            55.5 Pa(L), 7.2 Hz
        ▲ ▼ Prev/Next   ▶ More   ✔ Menu   ✖ Back
```

   i.   Press the **Right Arrow** key to review more data associated with the selected event. Click the **Up** or **Down Arrow** to view the **Prev/Next Event** data, or the **Cancel** key to go **Back** to the previous menu:

```
 Vibration channel:     Tran      Vert      Long
 PPV:                   47.6      62.0      49.8 mm/s
 ZC Frequency:          32        37        32 Hz
 Peak Acceleration:     0.968     1.480     1.060 g
 Peak Displacement:     0.226     0.273     0.230 mm
 Sensor Check:          Pass      Pass      Pass
                              ▶ More   ✖ Back
```

   ii. Press the **Right Arrow** key to review more data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:

```
 Pressure Channel:      MicL
 Weighting:             Linear
 Peak Sound Pressure:  .0200 psi
 ZC Frequency:          2 Hz
 Sensor Check:          Pass


                              ✖ Back
```

b. Within the **View Data** window, select the **Right Arrow** key to display the **Detail** of a selected Histogram event. Below is an example of the **Detail** feature for a Histogram Event:

```
 Event, 10/15/2008, 2:55:04 PM                     Factory
 Operator:              Richard Smith
 Trigger:               5 sec. Interval
 Duration:              10/15/2008 2:55:04 – 4 Intervals
 Maximum Vib:           7.35, 2 Hz
 Maximum OP:            0.00022, 17 Hz
        ▲ ▼ Prev/Next   ▶ More   ✔ Menu   ✖ Back
```

i. Press the **Right Arrow** key to review more data associated with the selected event, or the **Cancel** key to go **Back** to the previous menu:

Vibration channel:	Tran	Vert	Long
PPV:	7.35	0.131	7.16 in./s
ZC Frequency:	2	18	2 Hz
Peak Acceleration:	1.62	0.104	1.07 g
Peak Displacement:	0.534	0.00679	0.445 inch
Sensor Check:	Pass	Pass	Pass

▶ More ✖ Back

ii. Press the **Right Arrow** key to review more data associated with the selected event, or the **Cancel** to go **Back** to the previous menu:

Pressure Channel:	MicL
Weighting:	Linear
Peak Sound Pressure:	0.00022 psi
ZC Frequency:	17 Hz
Sensor Check:	Pass

✖ Back

5. When these different types of recorded events are transferred to the THOR or Blastware Event Manager, each one is given a specific character to denote the Type of file it is, as indicated in the example from Blastware below:

Monitor Log
Waveform
Advanced Waveform
Processed Waveform
Histogram
Processed Histogram

Type	Serial No.	Date/Time	No. Chan
LOG	MP12531	Jan 2 /05 18:23:40	***
W	MP12531	Jan 2 /05 18:23:52	6
AW	MP12531	Jan 2 /05 18:30:50	6
PW	MP12531	Jan 2 /05 18:31:02	6
H	MP12531	Jan 2 /05 18:31:47	6
P H	MP12531	Jan 2 /05 18:33:11	6
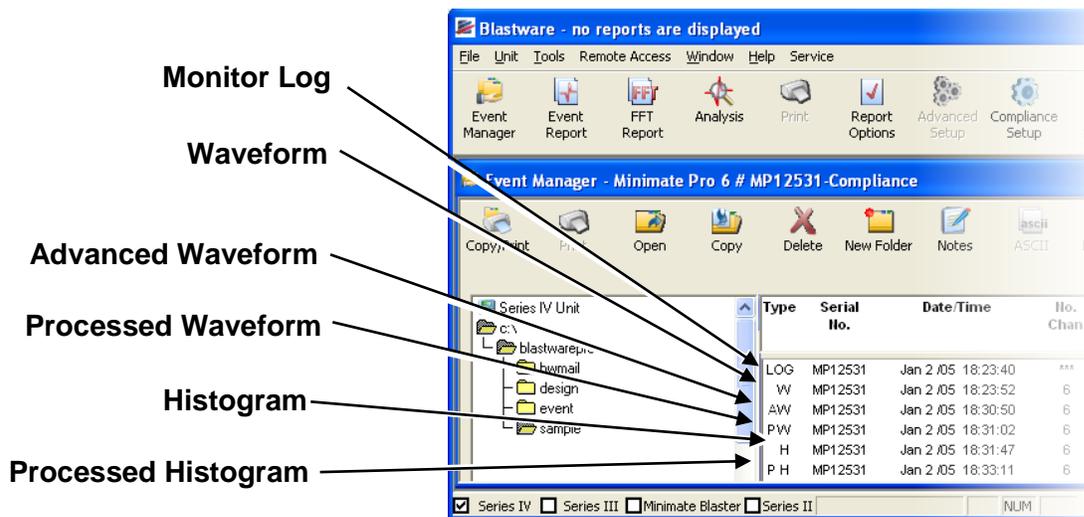
NOTE: In the picture above, two Events have a "**P**" as part of their designation – this indicates that the Event was copied and subsequently 'Processed' by using the Tools and/or Process features of the Blastware software.

NOTE: The **LOG** file type is a history of the monitoring activity; double-clicking on this file type will display the associated Monitor Log information.

6. Below is a display of the top level menu items and paths:

NOTE: The settings and data may vary, dependent on the Setup File used or Event viewed.

Edit Current Setup

Record Mode:	Waveform *[Waveform Manual, Histogram, Histogram Combo, Vibration Dose Value (Optional)]*
Vibration:	ISEE Triaxial Geophone
Pressure:	ISEE Linear Microphone *[or Pressure for Geophone option on Minimate Pro]*
Sample Rate:	1024 *[512 (for 1-80hz Din Geo), 1024, 2048, or 4096]*
Trigger Level:	Vib 0.500 *[New Menu]*
Record Time:	Fixed Time, 5 sec *[or AutoRecord, New Menu]*
Monitor Scheduler:	Off *[on]*
Auxiliary I/O:	Off *[New Menu]*
Scaled Distance:	Off – Edit *[New Menu]*
GPS Location:	Edit *[New Menu]*
Location:	User Specified *[Edit Menu]*
Company:	User Specified *[Edit Menu]*
General Notes:	User Specified *[Edit Menu]*
Job Number:	Off *[on]*

▲▼Next/Prev ▶Edit ✔Save ✖Cancel

Preferences

Sensor Check:	Disabled *[Before Event, After Event]*
Measurement System:	Metric *[Imperial]*
Pressure Units:	Pa *[dB] [psi or dB if Imperial is set]*
Display and Sound:	Edit
Ethernet:	On/Automatic
Auto Call Home:	Edit
Date and Time:	Edit
Password Protection:	Off *[on]*
GPS Event Synchronization:	Off *[on]*
Reset to Factory Defaults:	Now *[Right Arrow key resets defaults]*

▲▼Next/Prev ▶Edit ✔Save ✖Cancel

Select Setup File

Factory
Jones Quarry #2
Reed Stone South
Reed Stone West
Reed Stone Crusher

Select as Current Setup
Delete Setup File

▲▼Next/Prev ▶View/Edit ✔Select ✖Cancel

12/15/2008 12:24:05 PM

Select Setup File
Select Operator
Vibration: ISEE Tri... View/Edit Setup File
Pressure: ISEE Lin... View/Edit Preferences
Maintenance Menu
▼View Data Files

Select Operator P. Jones

Operator 1
Operator 2
P. Jones
R. Philips
B. Phelps

Select as Operator
Add Operator
Delete Operator
Rename Operator

▲▼Next/Prev ✔Menu ✖Cancel

Maintenance

About
View Channel Data
View Battery Data
View Ethernet Data
Self Check   Now
Disconnect Battery
Zero Offsets
Sound Level Microphone   Field Calibration

▲▼Next/Prev ▶Action ✖Cancel

Setup   1 of 8

Date	Time	
+ 12/15/2008	10...	...one South Pit
+ 12/15/2008	10...	...tone South Pit
✦ 12/15/2008	12...	Mark/Unmark File
+ 12/23/2008	02...	Delete File
+ 12/23/2008	02...	Delete Marked
		Delete All

▲▼Next/Prev ▶Detail ✔Menu ✖Exit

Event, 10/15/2008, 2:55:04 PM   Factory

Operator:	Richard Smith
Trigger:	
Duration:	Mark/Unmark File – 4 Intervals
Maximum Vib:	Delete File
Maximum OP:	0.0022 7 Hz

▲▼Prev/Next ▶More ✔Menu ✖Back

Vibration channel:	Tran	Vert	Long
PPV:	7.35	0.131	7.16 in./s
ZC Frequency:	2	18	2 Hz
Peak Acceleration:	1.62	0.104	1.07 g
Peak Displacement:	0.534	0.00679	0.445 inch
Sensor Check:	Pass	Pass	Pass

▶More ✖Back

Pressure Channel:	MicL
Weighting:	Linear
Peak Sound Pressure:	0.00022 psi
ZC Frequency:	17 Hz
Sensor Check:	Pass

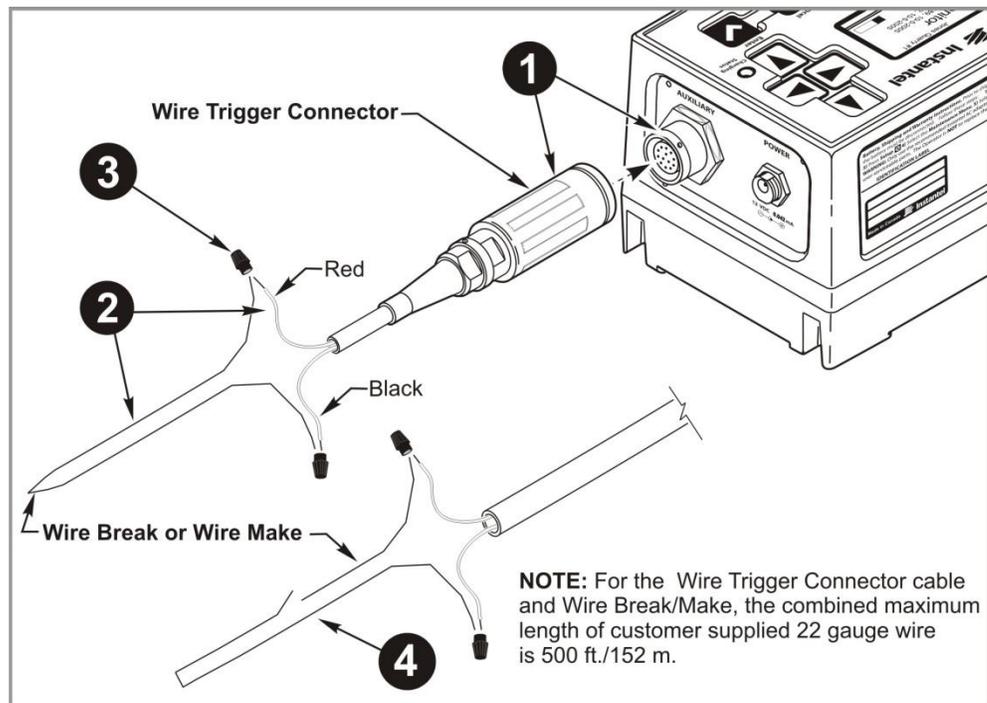✖Back

5

7. OPTIONAL FEATURES

7.1. Wire Break/Make Trigger Cable [Optional]

The optional **Wire Break/Make Trigger Cable** (Part No. 720A3501) for the Series IV units is available for purchase from your authorized **Instantel Dealer Representative** and is shipped with an installation and setup sheet. The Wire Break/Make Trigger Cable is used to trigger up to six Minimate Pro units; a Wire Break/Make Trigger Cable is required for each unit to be triggered.

The unit's auxiliary channel senses the wire trigger signal via a 22 gauge **Break** or **Make** wire provided by the operator, and starts recording. A signal occurs when the Break or Make trigger wires separate or create a contact, a) a Break signal from a blast physically breaking the trigger wire, or b) a Make signal occurs when the trigger wires contact, such as an operator pressing a push button switch.

Tools and Materials Required:

1. **Series IV** Unit(s) – up to six units may be connected
2. **Wire Break/Make Trigger Cable**, one for each unit (Part No. 720A3501), with instructions
3. Red and Black 22 Gauge Wire, up to 500 ft/152 m
4. Wire Strippers
5. A Two-way Switch, for each **Make** trigger setup
6. Electrical tape, as required

Single Wire Break/Make Trigger Cable Setup
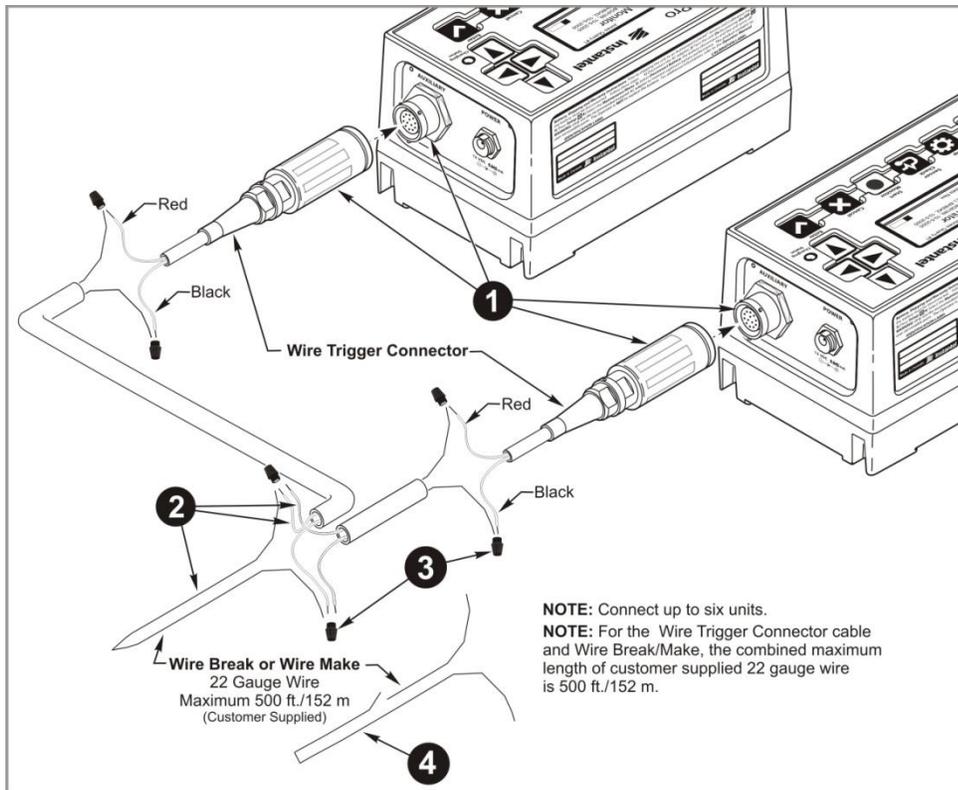
Multiple Wire Break/Make Trigger Cable Setup

7.2.   Remote Alarm [Optional]

The optional **Remote Alarm** (Part No. 720A3901) for the Series IV units is available for purchase from your authorized Instantel Dealer Representative, and is provided with an installation instruction sheet.
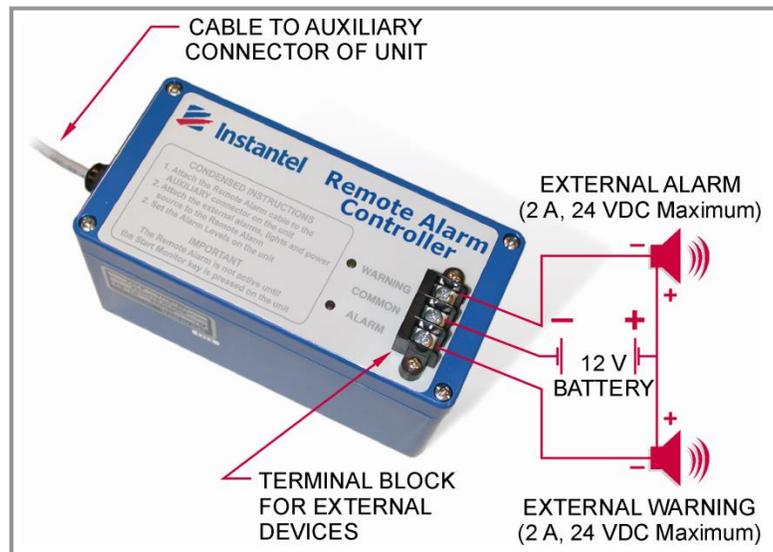
The Remote Alarm Controller indicates normal and over-triggering at a remote site. Use an optional extension cable to extend the length of the input cable; the output from the terminal block of the Remote Alarm Controller box can be used to run long distances to drive an external alarm.

The Alarm Levels within the monitor setup menu controls the triggering of the Remote Alarm Controller based on the levels set for Vibration or Pressure. The remote alarm sounds two alarms: **warning** and **alarm**. The warning alarm sounds when Event activity exceeds the Vibration Level or Pressure Level. The Vibration Alarm Level and/or the Pressure Alarm Level can be set to a higher level than the Geophone Trigger Level and the Pressure Trigger Level. This allows for the triggering of a second alarm at the higher level.

For example, in pile driving operations the remote alarm triggers a warning when activity exceeds the trigger level for the geophone, notifying the operator that the pile driving activity has exceeded the set level. The second alarm triggers when activity exceeds the Vibration Alarm Trigger Level, set to a higher level, notifying the operator that operations should cease immediately.

Tools and Materials Required:
1. Series IV Unit
2. Remote Alarm Controller (Part No. 720A3901), with instructions
3. External Alarm with power source (required - not supplied)
4. Optional Series IV Remote Alarm/RS-232 Splitter Cable. Used when both a Remote Alarm Controller and a modem must be connected to the monitor at the same time (Part No. 720A4001)
5. Optional Series IV Extension Cable, Connector Kit (Part No. 720A3801)

7.3. View Real Time Histogram Data [Optional]

View Histogram data in real time over the Internet with Ethernet connectivity, with THOR or the Blastware Advanced Module, and the Ethernet Communications option. Contact your authorized Instantel Dealer Representative for more information. Ethernet is a high-speed network standard of communication protocol that is primarily used for Local Area Networks (LAN) to connect end-systems, in this instance, the Series IV units to a network.

To use this feature, a telephone (cellular or satellite), modem connection to your Minimate Pro monitor, a PC equipped with a free Ethernet port or router, and the Microsoft Windows operating system are required. The speed of the data transfer will be determined by the connection quality and supported rate.

Tools and Materials Required:
1. Series IV Unit
2. THOR or the Blastware Advanced Module
3. Ethernet Communications Cable
4. Ethernet Connectivity Hardware (required – not supplied)

7.4. Vibration Dose Value (VDV) [Optional]

The optional Vibration Dose Value (VDV) Record Mode is available with THOR or the Blastware Advanced Module software. If you have a licensed copy of this software, follow the instructions in the software Operator Manual for Reloading the Operating System of the Minimate Pro, which will load the VDV feature into the unit.

The VDV monitoring option is used to measure and determine whole-body vibration based on a Frequency Weighting file that is downloaded from THOR or Blastware. Your geographic location and the type of vibration that you are monitoring will determine which Frequency Weighting file that you choose to use during the monitoring session – the frequency range of the data collected is from 1 to 80 Hz. Two frequency weighting files may be downloaded to the monitor.

While monitoring, the unit differentiates the velocity data into acceleration, applies the frequency weighting and then calculates the VDV and Root Mean Square (RMS) values. The unit displays the VDV and RMS values every ten seconds while recording, and stores the final calculations as part of the file and Event Report.

The unit is capable of continuously monitoring full waveform data for 24 hours; the daytime VDV monitoring is performed on the vertical channel (7:00 AM to 11:00 PM) while the nighttime VDV monitoring is performed on the horizontal channels (11:00 PM to 7:00 AM). The Monitor Scheduler feature can be used to specify the different settings required for daytime and nighttime monitoring setup files.

NOTE: Due to the processing power and decimal accuracy of a PC, performing **VDV** calculations using the Human Exposure tool on the software will typically produce a higher accuracy result when compared to the **VDV** recorded in the field by the **Minimate Pro** unit. These results will typically be within 5% of each other.

Tools and Materials Required:
1. **Series IV** Unit
2. **THOR** or the **Blastware Advanced Module**
3. **Instantel** 1-80Hz DIN Geophone (Part No. 720A2003)

7.5. External GPS [Optional]

Use the external **GPS (Global Positioning System) Location** feature to enter location information of the sensor and unit, relative to the blast and have them displayed on your Event Reports. External GPS devices locate your exact longitude and latitude from orbiting satellites.

Tools and Materials Required:
1. **Series IV** Unit
2. GPS unit must be NMEA 4800 compliant (Instantel supports the **Garmin® eTrex®** handheld GPS unit).

7.6. GPS Event Synchronization [Optional]

The Minimate Pro has internal GPS capability, which allows you to synchronize the time between two or more units using the GPS time. The accuracy of the time difference is dependent on the sample rate that is configured.

For more information about this feature, see Section "9.5.9 GPS Event Synchronization".

7.7. Series IV Sound Level Microphone [Optional]

The Series IV Sound Level Microphone can perform unattended monitoring of noise, such as building activities, construction, traffic, and mining operations. It is now possible to combine noise and vibration monitoring on the same unit, making the Minimate Pro4™ or Minimate Pro6™ a cost effective and flexible monitor for these applications. The microphone ships with a microphone stand and windscreen.

The Sound Level Microphone was designed to meet the requirements for IEC Class 1, which includes A- and C-weighted specifications. It has a measuring range from 30 to 140 dB with a fast or slow response. It is also capable of recording the unfiltered response in one of two ranges, +/− 25 Pa or +/− 100 Pa. The record mode can be set to Manual trigger, Waveform (records up to 9000 seconds once a preset trigger level has been exceeded), Histogram (with intervals from 2 seconds to 1 hour) or Histogram-Combo (Compliance mode only, this combines histogram and waveform monitoring at the same time).

In THOR or the Blastware Advanced Mode setup, it can also trigger and record unfiltered sound clips up to 90 seconds long. The resulting data file can then be played back in the software to help determine the source or it can be further processed, including third octave frequency analysis.

The microphone connects directly to the overpressure channel of the Minimate Pro4 or Minimate Pro6. For additional flexibility, the Minimate Pro6 is capable of monitoring two Sound Level Microphones at the same time using the software. These microphones can be connected directly to the unit or using an extension cable up to 75 meters (250 feet) long.

7.7.1. Installing the Sound Level Microphone

WARNING: Handle the microphone with care. Dropping the microphone or otherwise subjecting it to impact may damage the microphone element. The windscreen can help to protect the microphone, and its use is recommended.

The optional Sound Level Microphone (Part No. 720A5101) is only compatible with the Minimate Pro4 or Minimate Pro6 monitors. It is the Operator's responsibility to ensure that the Sound Level Microphone has been calibrated at an Instantel Authorized Calibration facility, at the Instantel Factory or in the field. Refer to the Maintenance Menu section of this manual for the calibration instructions. Refer to the IEC 61672-1 specification for additional technical descriptions of terms. Section 7.7.7 includes additional information required for the IEC 61672-1 specification.

Follow the steps below to install the microphone in the desired location:

7.7.2. Microphone Installation Procedure

1. Attach the calibrated Class 1 Sound Level Microphone(s) to the Minimate Pro4 or Minimate Pro6, which allows for the use of two microphones, as shown below:
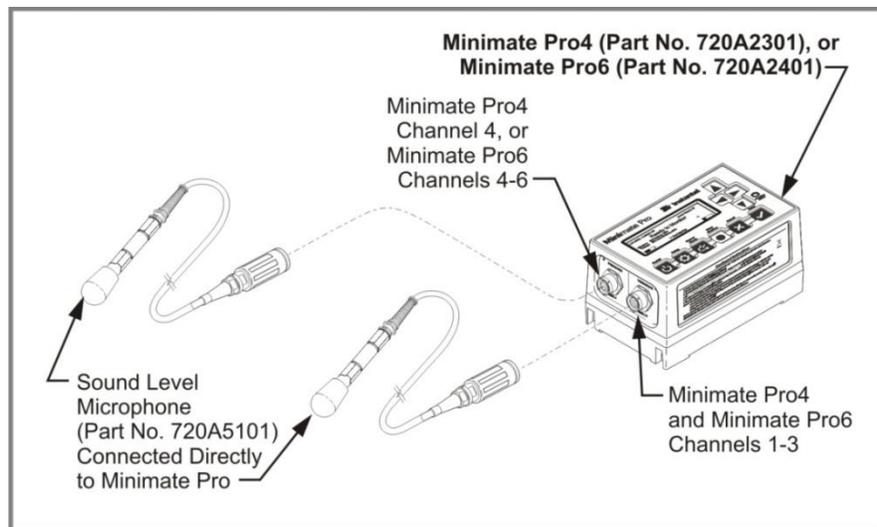
2. Minimate Pro Microphones come with a three-sectional mounting stand. Refer to the instruction sheet that was shipped with the microphone stand for proper installation. Locate the position of interest where you will be inserting the mounting stand for the microphone.

    NOTE: Install the microphone as far from surrounding objects and structures as possible to reduce any possible acoustic reflections; optimally, the microphone and monitor should be placed at a distance closer to the noise source than any surrounding objects including the monitor. Do not place the microphone in direct rain. Use the supplied microphone stand to elevate the microphone off the ground – the microphone should never be held by hand.

3. Insert the microphone into the mounting bracket on the top of the stand, and attach the windscreen to reduce false triggering.

4. Ensure that the element is pointed towards the acoustic event of interest.

5. If in Compliance Mode (where the Setup File name in the upper right corner of the Minimate Pro display ends in ".nsb"), press **Sensor Check** on the Minimate Pro to ensure that the sensor is properly attached.

6. The microphone windscreen does not affect the microphone response and is acoustically transparent.

NOTE: Some microphone windscreens can attenuate the response – it is recommended that this is confirmed prior to using any windscreens other than the one provided with the Sound Level Microphone.

7.7.3. Sound Level Microphone – Unit Compliance Setup

1. The Sound Level Microphone can be configured directly on the Minimate Pro4 or Minimate Pro6 monitor, or in the software.
2. If the unit has already been configured for Sound Level Microphones, they will appear on the Channel of the display that corresponds with the connector that the microphone(s) are attached.
3. Once the Compliance setup file has been downloaded into a monitor, it can be edited in the **View/Edit Setup File** menu. Compliance Setup files end with a ".nsb" file extension.
4. On the monitor, press **Setup**.
5. Press the **Down Arrow** and select the **View/Edit Setup File** menu.
6. Scroll down to the **Pressure Channel** (or **Vibration Channel**, dependent on the setup file configuration) and press the **Right Arrow** to access the sensor options.
7. Select the **Sound Level Microphone** sensor.
8. Press the **Down Arrow** and locate the **Sound Mic Setup** menu option.
9. Press the **Right Arrow** to enter this menu and edit the **Mic Weighting** and **Mic Response**.
   a. Press the **Right Arrow** to select either **A** or **C Weighting**.
   b. Press the **Down Arrow** to select the **Mic Response** option.
   c. Press the **Right Arrow** to select either **Fast** or **Slow**.
   d. Press **Enter** to accept the new settings or **Cancel** to return to the **Setup** menu.
10. Within the **Setup** menu, ensure that the **Sample Rate**, **Trigger Level** and **Record Times** are also set correctly.
11. Press **Enter** to save any changes made.

NOTE: Refer to the **THOR** or **Blastware Operator Manual** for information on editing the setup within the software module.

7.7.4. Sound Level Microphone – Unit Advanced Setup

1. Two Sound Level Microphones can only be completely configured in **THOR** or **Blastware**, including the **Trigger Level**, **Mic Weighting (Unfiltered)**, and **Mic Response**. These must be downloaded to the unit as a Setup File. Advanced Setup files end with a ".nsa" file extension. Refer to the **THOR** or **Blastware Operator Manual** for information on how to set these variables.
2. If the unit has already been configured for a Sound Level Microphone(s) it will appear on the main display, as follows (if two are connected):
   Vibration 1: Sound, Vert, Long
   Vibration 2: Sound
3. The current setup file is displayed in the top right corner when the unit displays the **Ready to Monitor** message. If this file is not the correct file, press **Setup** and select the **Select Setup File** menu.
4. Press **Down Arrow** until the correct setup file is highlighted.
5. Press **Enter** to open the options window.
6. Press **Enter** to **Select as Current Setup** option. The monitor displays the message that the selected file is now current.
7. Press **Cancel** to exit the **Select Setup File** menu.
8. Press **Cancel** again to return to the **Ready to Monitor** display.

NOTE: The channel name on the Main Display (i.e. Sound) can only be changed using the **THOR** or **Blastware** software.

7.7.5. Using the Sound Level Microphone

1. **Sensor Check** is only available in Compliance Mode. Press **Sensor Check** on the **Minimate Pro** to ensure that the sensor is properly attached. A successful **Sensor Check** will return results similar to this:
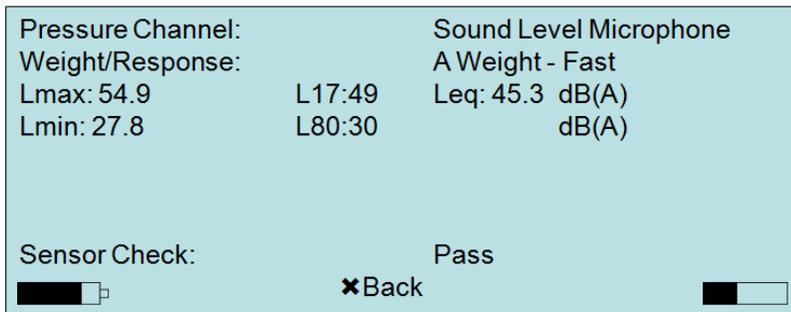
   | MicA | Pass | Freq= N/A | Amp=563 mv |

   NOTE: The name of 'MicA' is editable in the **THOR** or **Blastware** setup.

2. Press **Enter** to continue.
3. Press **Start Monitor** on the unit.
4. If the unit triggers immediately you may need to increase the **Trigger Level**. Review the peak of the previous event, and set the **Trigger Level** at least 3 dB above that value.
5. Press **Start Monitor**.
6. If the unit triggers immediately repeat the previous step otherwise clap your hands in front of the microphone to ensure the unit will trigger.
7. The system will now monitor and record data whenever the **Trigger Level** has been exceeded.

7.7.6. View Compliance Events

1. Once the monitor has recorded at least one event it will display the Lmax level of that event on the display.
2. To view other recorded data on the unit press **Down Arrow** from the main display and highlight the desired event.
3. Press **Right Arrow** three times to display the results of the **Pressure Channel**. The sound data results that will be displayed are the Lmax, Lmin, L90, L10 and Leq values for the entire recording time.

```
Pressure Channel:              Sound Level Microphone
Weight/Response:               A Weight - Fast
Lmax: 54.9        L17:49       Leq: 45.3  dB(A)
Lmin: 27.8        L80:30              dB(A)




Sensor Check:                  Pass
████▌▯                 ✖Back                    ███▯
```

NOTE: Refer to the **THOR** or **Blastware Operator Manual** for information about how to view, analyze and/or export the recorded data for Compliance and Advanced mode software.

7.7.7. Technical Information for IEC 61672-1 Compliance

1. The Sound Level Microphone is a Group Z, Class 1 instrument.
   a. Group Z refers to an instrument consisting of two separate components that must be connected.
2. Dependent on which software module is used, Compliance or Advanced, different data results may be achieved or settings applied, as shown below:

Specifications	Compliance Mode	Advanced Mode (Optional)
Weighting	A-Weight and C-Weight	Unfiltered
Frequency Range	Up to 20 kHz	Up to 20 kHz
Response	Fast 125 ms, Slow 1 s	N/A
Sensitivity	N/A	0.0038 V/Pa (Normal), 0.12 V/Pa

		(Sensitive)
Resolution	0.05 dB (display limit 0.1dB)	0.03 Pa (Normal), 0.89 mPa (Sensitive)
Range	Automatic	$+/-$ 100 Pa (Normal), $+/-$ 25 Pa (Sensitive)
Trigger Levels	33 dB $-$ 140 dB	0.448 $-$ 100 Pa (Normal), 0.0142 Pa $-$ 25 Pa (Sensitive)
Sample Rate	1024 sps Recommended	64 Ksps Recommended
Cable Length	6 ft (2 m)	6 ft (2 m)
Maximum Amplitude	160 dB	160 dB

3. The microphone reference point is at the center of the diaphragm of the microphone.
   a. As the microphone was designed to be omni-directional, there should be minimum angular variation in the microphone response at low frequencies. Sound diffraction on the microphone face only has a significant effect on the response for frequencies above approximately 3.5 KHz. The nominal correction curves, for specific angles, and provided in the following graph. The top curve is for zero degrees, i.e. the microphone face is perpendicular to the plane acoustic wave. The correction is subtracted from the response. Below is a chart representing Sound Level Microphone Angular Response and the Free Field Angular Corrections in Hz:

	1 KHz	4 KHz	6 KHz	8 KHz	10 KHz	15 KHz	20 KHz
0 degrees	0 dB	1.0 dB	2.2 dB	3.5 dB	5.0 dB	8.0 dB	9.5 dB
30 degrees	0 dB	0.5 dB	1.8 dB	3.0 dB	4.2 dB	5.5 dB	7.0 dB
60 degrees	0 dB	0.2 dB	0.8 dB	2.0 dB	3.0 dB	4.0 dB	3.0 dB
90 degrees	0 dB	0 dB	0.2 dB	0.3 dB	0.8 dB	1.3 dB	−0.5 dB
120 degrees	0 dB	0 dB	0 dB	−0.2 dB	−0.2 dB	0 dB	−3.0 dB
150 degrees	0 dB	0 dB	−0.2 dB	−0.3 dB	−0.4 dB	−0.3 dB	−3.5 dB
180 degrees	0 dB	−0.2 dB	−0.4 dB	−0.5 dB	−0.7 dB	−0.8 dB	−4.0 dB

4. The minimum trigger level is set as 33 dB, which is 3 dB above the minimum detectable sound level. This provides a margin against false triggering by self-generated noise.
5. Overload Indicator: Input that is greater than 140 dB is replaced by the "*" character in the data listing. Range switching within the 30 dB to 140 dB range is automatic.
6. Displayed values (including Overload and Under-range indicators) are held until the trigger is exceeded again, or until the end of the subsequent period of recording the Event.
7. The average self-generated noise level has been measured at 29 dB. The noise level of the acoustic element is below this, about 24 dB.
8. The nominal drift of the Time of Day display on the monitor over a 24 hour period is 0.2 seconds.
9. When applied to levels specified by IEC 61000-4-2 (Industrial), ESD has no impact on product operation or accuracy in data.
10. The product meets all (60Hz) immunity requirements of:
    a. IEC 61000-4-6 (Industrial) for conducted RF
    b. IEC 61000-4-5 (Industrial) for surge
    c. IEC 61000-4-4 (Industrial) for bursts
    d. IEC 61000-4-3 (Industrial) for EMI compatibility
11. The level linearity error, over 20 dB (measured at 2 KHz) is $+/-$ 0.4 dB.
12. The highest sound pressure that will generate a linear response is 140 dB. Electrically, this corresponds to a 12 Vpp signal from the acoustic element.
13. When the Sound Level Microphone is operating in Advanced Mode (i.e. when raw acoustic data is input to the monitor), the response matches the response of the acoustic element (within 3 dB) over the frequency range 10Hz – 20 KHz.

14. Factory calibration testing is done at both the A-Weighting and C-Weighting, to ensure linearity of response during automatic range switching,
15. The worst-case environmental change would be from −40°C (−40°F) – +50°C (122°F), or vice versa. This is a 90°C (32°F) change. Recommended time to acclimatize the microphone to this temperature range is 2 hours.
16. There is no correlation between electromagnetic emissions and operation of the Sound Level Microphone, in any mode.
17. For the Sound Level Microphone, the least immunity to EMI would occur at the lowest input signal level, at any frequency, since the imposed electrical signals would be large compared to any desired input signal. To minimize induced noise, the cable between the microphone and the Monitor Unit should be parallel to any electrical field.
18. The Minimate Pro4 and Minimate Pro6 monitors use rechargeable lithium-Ion batteries. These batteries are not serviceable unless returned to the factory or to an authorized Instantel Calibration Site. There is no internal access to the batteries that provides for user maintenance without disassembly of the monitor and breach of warranty.
    a. Nominal battery life after full charge is 10 days.
    b. The AC charger supplied with the monitoring system is12V 1A. The current limit is confirmed by design analysis and product tests.
    c. The range of DC output voltages from the AC adapter for which correct operation is guaranteed is 8V – 16V.
    d. Sound Level Microphone may be operated indefinitely if plugged into an AC source as part of the monitoring system. However, the AC power supply is specified for operation in protected environments only. For extended operation outside, the AC charger may be replaced by a solar cell (supplied by the customer) or marine battery.
    e. There are no customer-accessible electrical outputs in the system.
    f. The only component of the product that must be operated in an environmentally controlled enclosure is the AC adapter for charging the batteries.

**Notes:**

8. BASIC TUTORIAL

In this basic tutorial, you will set up your computer and the supplied Instantel software to work together with the **Minimate Pro**. You will then create a sample Event using the **Manual Record Mode**, and transfer the Event file from your **Minimate Pro** to the computer. Once you have completed this, you view and print the **Event Summary Report**.

Step 1: Install the Software

1. Follow the installation instructions within the **THOR Operator Manual** or the **Blastware Operator Manual**.

Step 2: Connect the Geophone and Microphone to the Unit

1. Align and connect the ISEE or DIN Geophone(s) and/or the Linear Microphone to the connections with the proper labels on the **Minimate Pro**. Firmly hand-tighten each cable connector with a quarter turn of the cable connectors. For unit identification, the top label on the unit indicates if you have a **Minimate Pro4**, or **Minimate Pro6**.

    a. Connect the Geophone to the channel connector labeled **VIBRATION** (Blue) if you have a **Minimate Pro4**, or one Geophone to the **VIBRATION** (Red) and one Geophone to the **PRESSURE** (Red/Blue) channel connectors if you have a **Minimate Pro6**. Connect the Linear Microphone to the channel connector labeled **PRESSURE**.
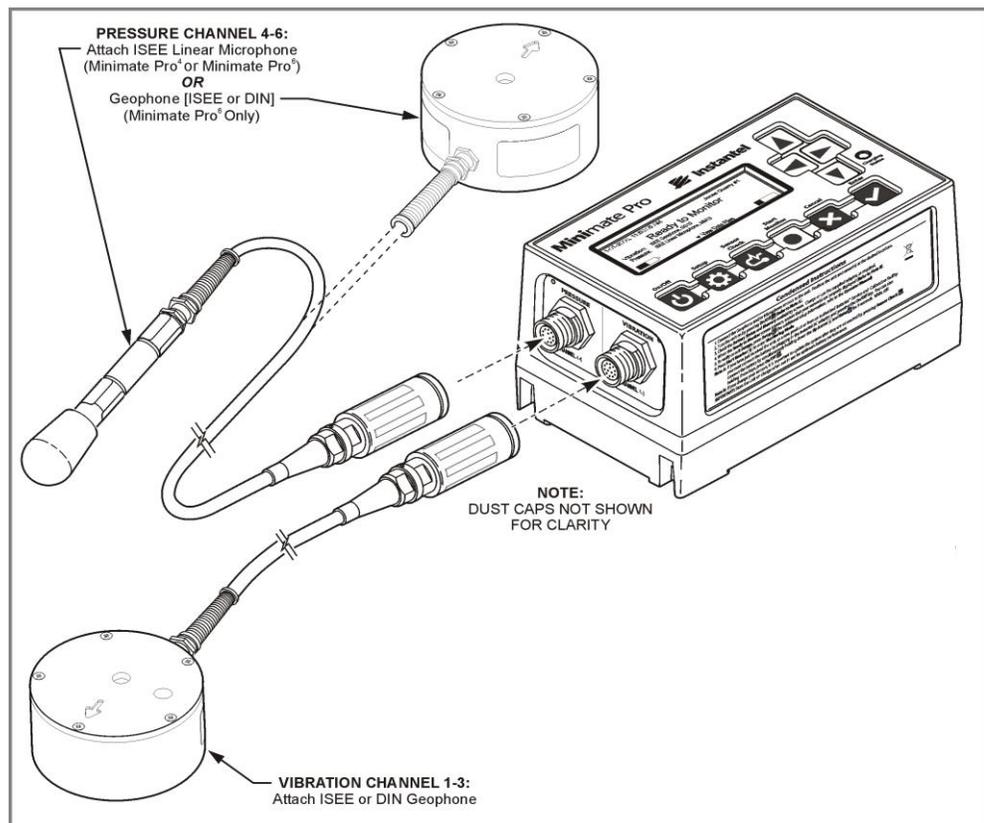
Step 3: Connect the Unit to the Computer and Power Supply

1. Connect the **Minimate Pro** to your computer using the Ethernet® communications cable. Secure the other end of the cable to the connector labeled **AUXILIARY** located on the right hand side of the **Minimate Pro**.

AUXILIARY
Connection
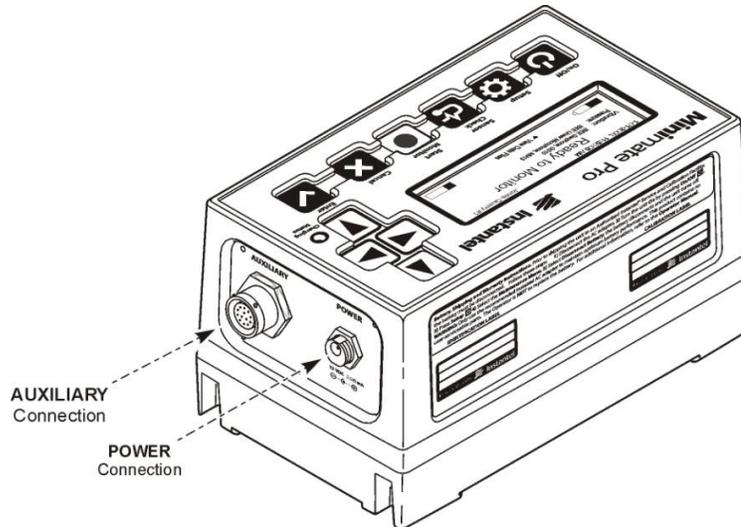
POWER
Connection

2. Connect the power supply to the unit and plug it into a wall receptacle. The figure above indicates the position of these connectors.

Step 4: Turn the Unit On

If you have received your **Minimate Pro** directly from an **Instantel Dealer**, or from an Authorized Instantel Service and Calibration Facility, the battery will be deactivated for shipping safety and battery life conservation. Turn the battery on for charging by plugging in the AC Adapter to the unit and an electrical outlet, and pressing the **On/Off** key. If you do not have the AC Adapter, turn on the unit by pressing the **Up Arrow** and **Enter** keys simultaneously for approximately three seconds, and then press the **On/Off** key while still holding the other two keys. The unit will flash on with the introductory screen, and then display the main screen.
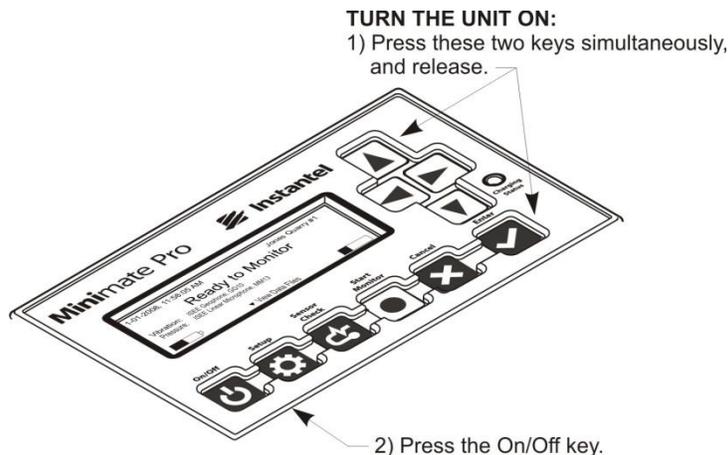
TURN THE UNIT ON:
1) Press these two keys simultaneously, and release.

2) Press the On/Off key.

NOTE: A **Charging Status** LED is mounted next to the **Down Arrow** key and indicates the following:

a. **The light is not on -** the charger is not connected to a power outlet, or the charger is not functioning properly.

b. **The light is yellow -** the charger is connected to a power outlet and is charging.

c. **The light is green -** the batteries are fully charged.

d. **The light is flashing red/yellow –** the power source is not sufficient (i.e. battery, solar panel, or malfunctioning charger).

1. After the introductory, battery and memory screens display, the main display screen will appear showing that the Geophone and Linear Microphone, if attached, (or additional Geophone, if you have purchased the **Minimate Pro6**) have been recognized during the initial **Sensor Check**. The Serial Number (e.g. SE12551) follows after each sensor type.

Step 5: Set up Communications

Setting up communications takes three steps:

- Setting up the static IP address on your computer
- Setting up Minimate Pro **Ethernet®** communications
- Setting up **THOR** or **Blastware** communications

This tutorial walks you through using setting up Minimate Pro communications connected directly to your computer, using a static IP address.

This tutorial assumes that you are using the supplied Ethernet® communication cable to connect directly to a laptop. If you have purchased the optional serial communications cable with the USB adaptor, proceed to that section of the manual for instructions.

Set up the Static IP Address on the Computer

1. Obtain an IP address and subnet mask from your Internet service provider or Network administrator.

2. On your computer, switch, router, or hub, set the IP address to the IP address you received from your Internet service provider or Network administrator. For information on how to set the IP address, see the documentation provided with your computer, switch, router, or hub.

3. Set the subnet mask of your computer, switch, router, or hub to the subnet mask you received from your Internet service provider or Network administrator. For information on how to set the IP address, see the documentation provided with your computer, switch, router, or hub.

Set up Minimate Pro Ethernet Communications

1. With the Minimate Pro connected to your computer, switch, router, or hub, start the Minimate Pro and click the **Setup** button. Press the **Down Arrow** key until **View/Edit Preferences** is highlighted, then press the **Enter** key.

2. Press the **Down Arrow** key until **Ethernet** is highlighted, then press the **Right Arrow** key.

3. Set the following options:
   - **Ethernet:** On
   - **Mode:** Static IP

4. Set the **Static IP Address** to the IP address you received from your Internet service provider or Network administrator.

5. Set the **Static IP mask** to match the subnet mask being used on the computer you want to connect to.

6. Press **Enter** twice to exit.

Set up THOR or Blastware

1. Follow the setup instructions within the **THOR Operator Manual** or the **Blastware Operator Manual**.

Step 6: Define the Contents of the Event Summary Report

THOR and **Blastware** create an **Event Summary Report** for each recorded Event. Both software programs offer you a wide degree of flexibility to define the contents and visual aspects of these reports. In this step, we enter a new report title, choose a **Compliance Report Graph**, and measurement units in Blastware.

1. Open the **Report Options** Menu by clicking on the icon, or access it from the **File** Menu.
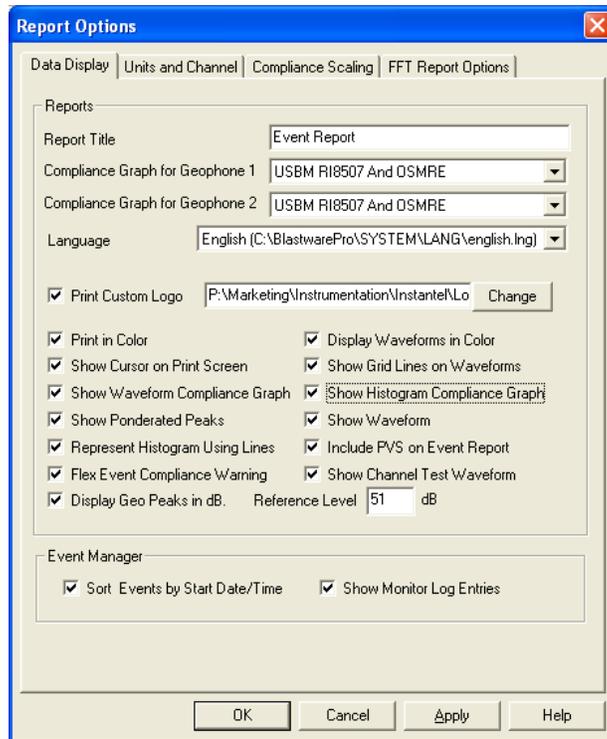
2. Change the **Report Title**.

   You can change the **Report Title** to a title of your choice. Position the mouse pointer in the **Report Title** text box. Press the **Backspace** key to delete the existing title. **Enter** a new title up to a maximum of forty nine characters.

3. Choose a **Compliance Report Graph**.

   The software supports numerous compliance report graphs. For **Minimate Pro4** and **Minimate Pro6** units, choose a **Compliance Report Graph** by positioning the mouse pointer over the **Compliance Graph for Geophone 1** dropdown menu and click the left mouse button. A list of supported **Compliance Reports** appears. Scroll through the list and choose a report by clicking the left mouse button. If you have a **Minimate Pro6** and have a second geophone attached to the monitor, you can select an associated graph by using the dropdown menu for **Compliance Graph for Geophone 2**.

2. All other **Report Options** are covered in more depth within the **THOR** or **Blastware Operator Manual**.

3. Press the **OK** button to close the dialog box and save your changes.

Step 7: Create or Edit a Setup File

You can create and edit setup files in both **THOR** and **Blastware.** In this step, we use **Blastware** to create a new **Compliance Setup**.

1. Select **Unit** menu, and click on **Setup**, and then **Compliance Setup**, or click on the **Compliance Setup** icon. At the bottom of the Compliance Setup, you will notice that the **VDV (Vibration Dose Value) Recording** option may not be available. If this is the case and you are using **Blastware**, you must order the optional **Blastware Advanced Module** software to gain access to this feature.

2. Modify the available settings as per your requirements and the sensors attached to the unit, then click on the **Send to Unit** button. Below is an example of the settings in Blastware:
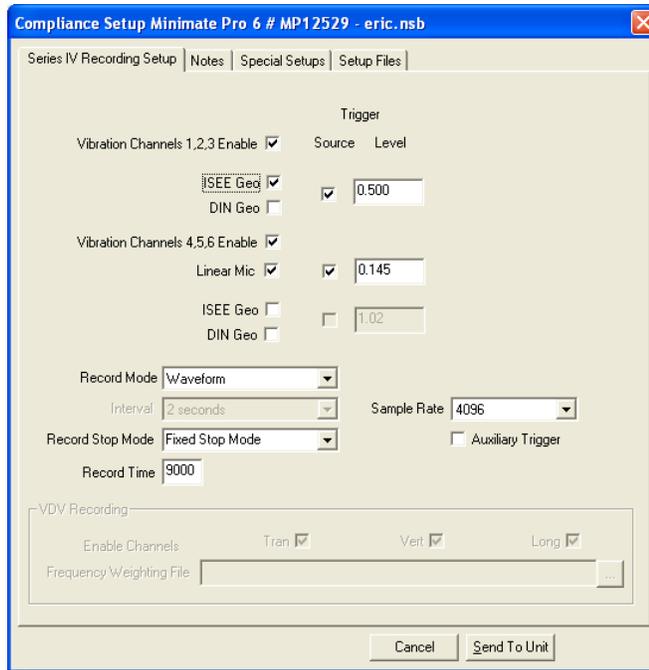
3. The software will open the **Setup Filename** dialog. **Enter** a setup name in the text box and click on **OK**.

4. After the **Setup Filename** has successfully been sent to the unit, the following message will appear:
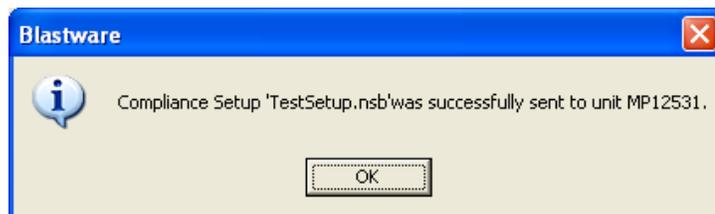
Select **OK** to return to the Compliance Setup dialog.

Step 8: Creating a Sample Event

Refer to *Section 6.5*, **Unit Keypad** and **Menu Navigation Overview**, to become familiar with the menus of the **Minimate Pro** prior to proceeding with this step.

1. Press the **Setup** key. The **Main Menu** appears, as follows:

2. Press the **Down Arrow** key until the **View/Edit Setup File** menu item is highlighted. Press the **Enter** key to access this menu.

> 10/15/2008   12:24:05 PM   Factory
>
> ## Waveform Monitoring
>
> ▲Levels Off   ▼View   ▶ Change   ✗ Cancel
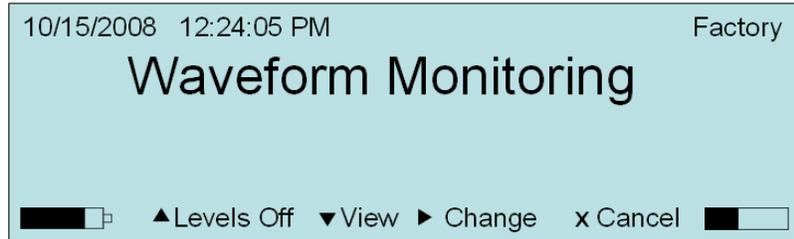
3. Highlight the **Record Mode** menu option and press the **Right Arrow** key to access the menu. Continue to press the **Right Arrow** key until the **Waveform Record Mode** option appears.

> Edit Current Setup
> Record Mode: Waveform
> Vibration: ISEE Triaxial Geophone
> Pressure: ISEE Linear Microphone
> Sample Rate: 1024
> Trigger Level: Vib 0.005
> ▲▼Next/Prev   ▶Edit   ✔ Save   ✗Cancel
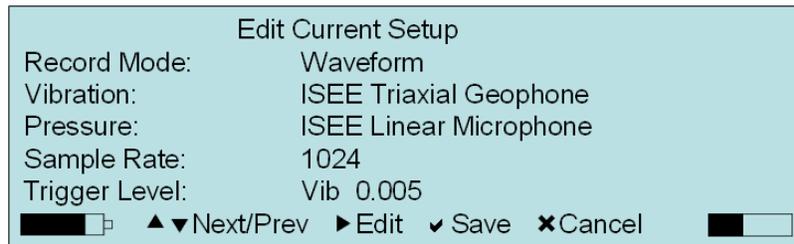
4. Press the **Enter** key to **Save** these settings. A **Save Setup to File** menu appears.

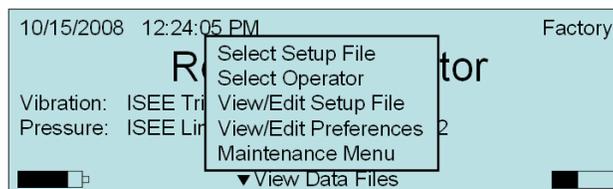   **TIP:** Use the **Save Setup File** name as a way to identify a location or particular settings used to record the **Event**s for easier identification.

5. Press the **Right** and **Left Arrow** keys to navigate the text field, and the **Up** or **Down Arrow** keys to **Change** the characters. Upper and lowercase alphabet characters are provided, as well as numerals 0 – 9, "-", and a space.

> Save Setup File
> Grover Site 1 – Manual
>
> ▲▼Next/Prev   ▶Edit   ✔ Save   ✗Cancel
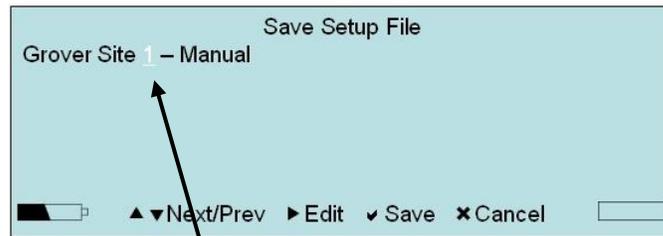
Use the **Right** and **Left Arrow** to navigate the text field, and the **Up** or **Down Arrow** to **Change** the characters

6. Once the **Setup File** name has been created, press the **Save** key. Press **Save** again to exit the **Setup Menu**, and **Cancel** again to get to the **Main Display**.

7. You are now **Ready to Monitor** by pressing the **Start Monitor** key on the unit. The unit will briefly display **Preparing to Monitor**.

8. The unit then displays the following messages:

> 10/15/2008   12:24:05 PM   Factory
>
> ## Preparing to Monitor
>
> ✗ Cancel

10/15/2008   12:24:05 PM   Factory
              Waveform Monitoring

■■■▯   ▲Levels Off   ▼View   ▶ Change   ✗ Cancel   ■■▯
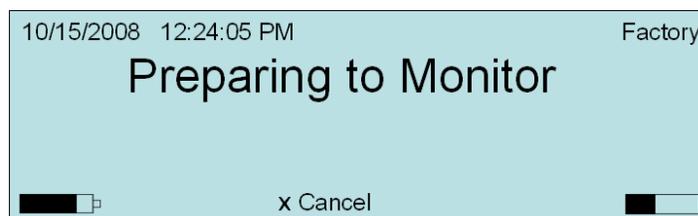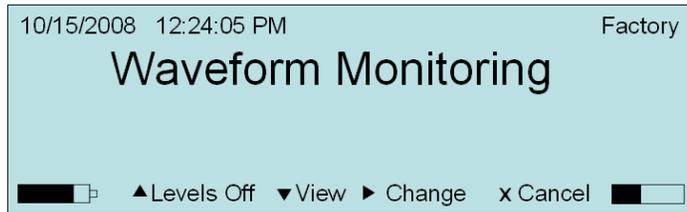
9. Lightly tap the surface next to the geophone, or gently on the geophone itself – the **Peak Vibration** results and **Zero Crossing (ZC) Frequency** of the recorded Event appear on the display:

10/15/2008   12:24:05 PM   Factory
         Press ✔ to Stop Recording
Peak: Vibration   ZC frequency
.549 in./s   15 Hz
■■■▯   ▲Levels Off   ▼View   ▶ Change   ✗ Cancel   ■■▯
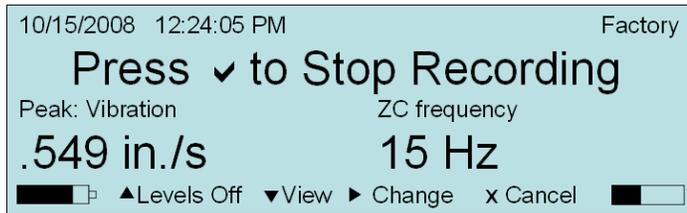
10. Press the **Right Arrow** to **Change** between **Peak Vibration** and **Peak Overpressure** results. There is a 1/3 second delay between an Event ending and the level data being displayed. If an Event is triggered during that delay the display is not updated. Below is an example of the two **Peak** and **ZC Frequency** readouts that are dynamically displayed:

10/15/2008   12:24:05 PM   Factory
              Waveform Recording
Peak: Vibration   ZC frequency
.549 in./s   15 Hz
■■■▯   ▲Levels Off   ▼View   ▶ Change   ✗ Cancel   ■■▯

10/15/2008   12:24:05 PM   Factory
              Waveform Recording
Peak: Pressure   ZC frequency
.00018 psi   256 Hz
■■■▯   ▲Levels Off   ▼View   ▶ Change   ✗ Cancel   ■■▯

11. Press the **Cancel** key to stop recording, and the screen will return to **Main Display**. At any time, during, before or after, you can push the **Down Arrow** key to turn **Levels Off** and the display will no longer be updated with the **Peak** and **ZC Frequency** information.

Step 9: View Data File Information on the Unit

1. From the main menu, select the **Down Arrow** key on the unit to access **View Data Files**. The **View Data Files** command is also accessible while recording.
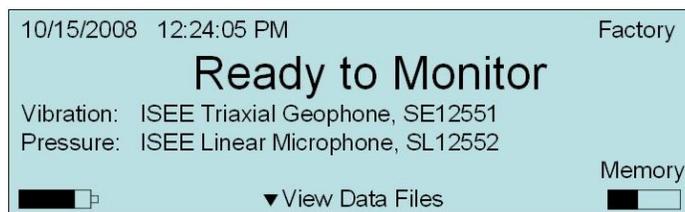
10/15/2008   12:24:05 PM   Factory
              Ready to Monitor
Vibration: ISEE Triaxial Geophone, SE12551
Pressure: ISEE Linear Microphone, SL12552
                                                Memory
■■■▯   ▼View Data Files   ■■▯

2. A list of recorded Events will appear. Press the **Up** or **Down Arrow** keys on the unit to highlight **Next/Prev** Events. Press and hold the **Down** or **Up Arrow** key to quickly scroll. **Waveform** or **Histogram** Events have a different icon displayed:

SYMBOL REPRESENTING A RECORDED HISTOGRAM EVENT

Date	Time	Setup	1 of 8
⌇ 10/15/2008	10:12:49a	factory	
⌇ 10/15/2008	10:14:19a	factory	
⊥ 10/15/2008	12:17:09a	factory	
⌇ 10/23/2008	02:33:15a	Reed Stone South Pit	
⌇ 10/23/2008	02:35:15a	Reed Stone South Pit	

▲▼Next/Prev ▶Detail ✔Menu ✖Exit

SYMBOL REPRESENTING A RECORDED WAVEFORM EVENT

a. Press the **Right Arrow** key to display the **Detail** of an Event. Below is an example of the **Detail** feature for a *Waveform Manual Event*:

Event, 10/15/2008, 1:24:05 PM		Factory
Operator:	P. Jones	
Trigger:	Manual	
Duration:	1.0 sec, Fixed	
Maximum Vib:	62.0 mm/s, 37 Hz	
Maximum OP:	55.5 Pa(L), 7.2 Hz	

▲▼Prev/Next ▶More ✔Menu ✖Back

i. Press the **Right Arrow** key to review **More** data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:

Vibration channel:	Tran	Vert	Long
PPV:	47.6	62.0	49.8 mm/s
ZC Frequency:	32	37	32 Hz
Peak Acceleration:	0.968	1.480	1.060 g
Peak Displacement:	0.226	0.273	0.230 mm
Sensor Check:	Pass	Pass	Pass

▶More ✖Back

ii. Press the **Right Arrow** key to review more data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:

Pressure Channel:	MicL
Weighting:	Linear
Peak Sound Vibration:	.0200 psi
ZC Frequency:	2 Hz
Sensor Check:	Pass

✖Back

Step 10: Open the Event Manager

The **Event Manager** organizes the Event files stored on your computer similar to the Windows File Manager. The Event Manager allows you to **Copy**, **Delete**, **Print**, and **View** Events by simply selecting an Event and pressing the appropriate command icon. If you are using **Blastware** and the **Event Manager** is not open, click the mouse pointer on the **File Menu** then click on the **Event Manager** command.

The **Event Manager** dialog box appears. If you are using Blastware, ensure that you are in the proper directory, c:**Blastware**\\Event, and set this as the default by selecting the box next to **Default Directory**, shown in the lower left hand of the screen.

Default Directory
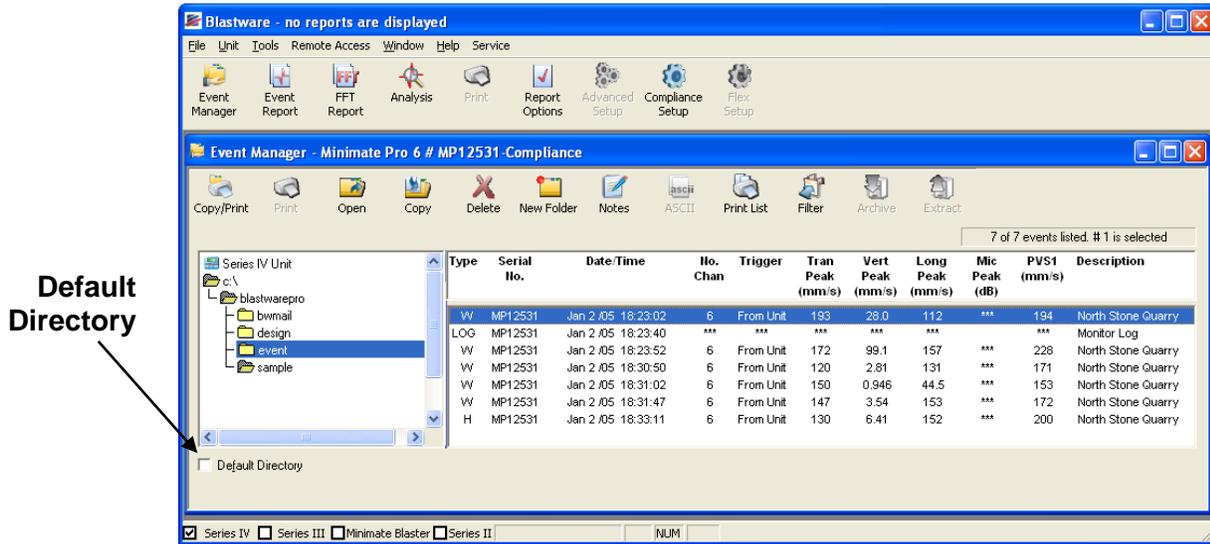
Step 11: Copy All the Events to Your Computer

You can copy events from the Minimate Pro to your computer using **THOR** or **Blastware**. This example shows you how to copy events using Blastware.

1. Copy Events from the **Minimate Pro** to your computer, by pressing the **Copy/Print** icon. The **Copy and Print All Events** dialog box appears. Press the **Yes** button to copy all the Events on the unit, and display them in the **Events List Box**. Click on the **Print** checkbox to print the Events on your computers default printer at the same time.
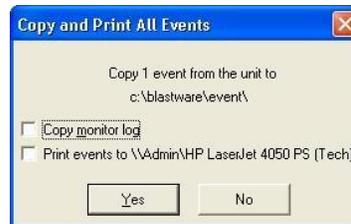
2. The Events will be automatically copied to your current version of the **Blastware** Event folder. When different types of recorded Events are transferred to the **Blastware** Event Manager, each one is given a specific character to denote the **Type** of file it is, as indicated below:

Monitor Log
Waveform
Advanced Waveform
Processed Waveform
Histogram
Processed Histogram
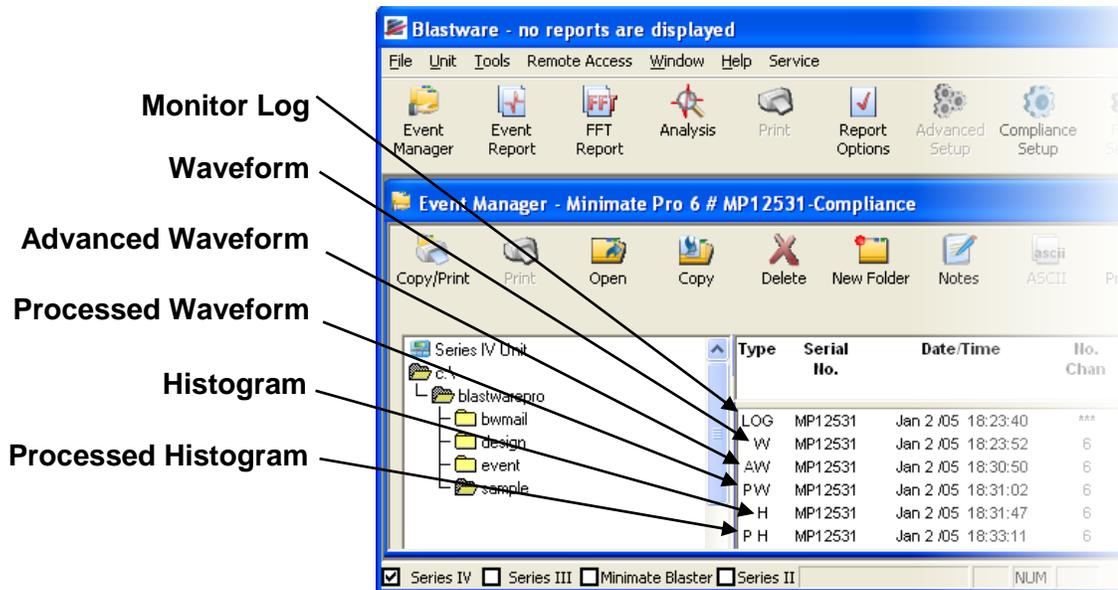
NOTE: Different recording selections (i.e. **Waveform** or **Histogram**) will produce a filename with a different **Type** noted. In the picture above, two Events have a "**P**" as part of their designation – this indicates that the Event was copied and subsequently 'Processed' by using the Tools and/or Process features of the **Blastware Advanced Module** software.

NOTE: The **LOG** file type is a history of the monitoring activity; double-clicking on this file type will display a **Monitoring Log**. The results for the **Self Check** feature will also appear here if you have turned it on – please refer to the **Self Check** section of this manual for more information on this diagnostic tool. An example **Monitor Log** is shown below:

Step 12: View an Event Report

You can view an **Event** or **FFT** Report by selecting an Event and clicking on the **Event Report** or **FFT Report** icons provided in the toolbar. These reports can also be accessed by pre-selecting them under the **Window** menu, using **Auto Open –** select the reports you would like to view automatically by highlighting them with a check mark. The default is all reports. To automatically

view reports using the **Auto Open** selections, highlight an Event and then double click your left mouse button on the desired Event, and the reports will be created in a new window based on the settings you have defined within the **File** menu, **Report Options** dialog.
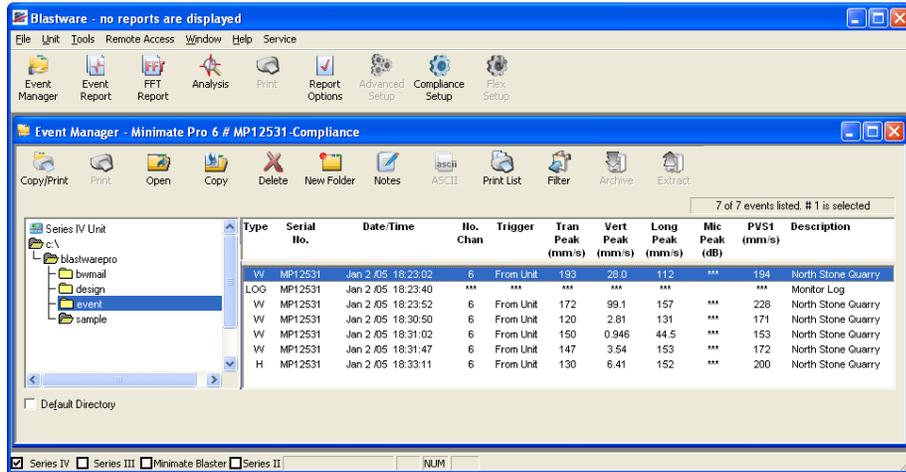
1. The settings of your PC monitor (i.e. 800 x 600) will determine the extent of the **Event Report** you will be able to view without scrolling.
   Scroll through the Event.

   Click on the **scroll bars (Arrows)** to scroll through the **Event Report**.

2. **View the Entire Event.**

   Click on the **File** Menu and choose the **Print Preview** command. The entire **Event Report** appears on your display.

3. **Add Post Event Notes.**

   Click on the **Tools Menu** and click on the **Post Event Notes** command. **Enter** your comments and press the **Apply to Event** button.

4. **Print the Event.**

   To print an Event, click on **File** Menu and click on the **Print** command, or use the **Print** icon available in the toolbar. If required, adjust the settings in the Printer dialog box and press **OK** or **Yes** to send the print job to your local default printer.

Below is an example of a **Series IV Event Report** in Blastware using the **Waveform Record Mode**:
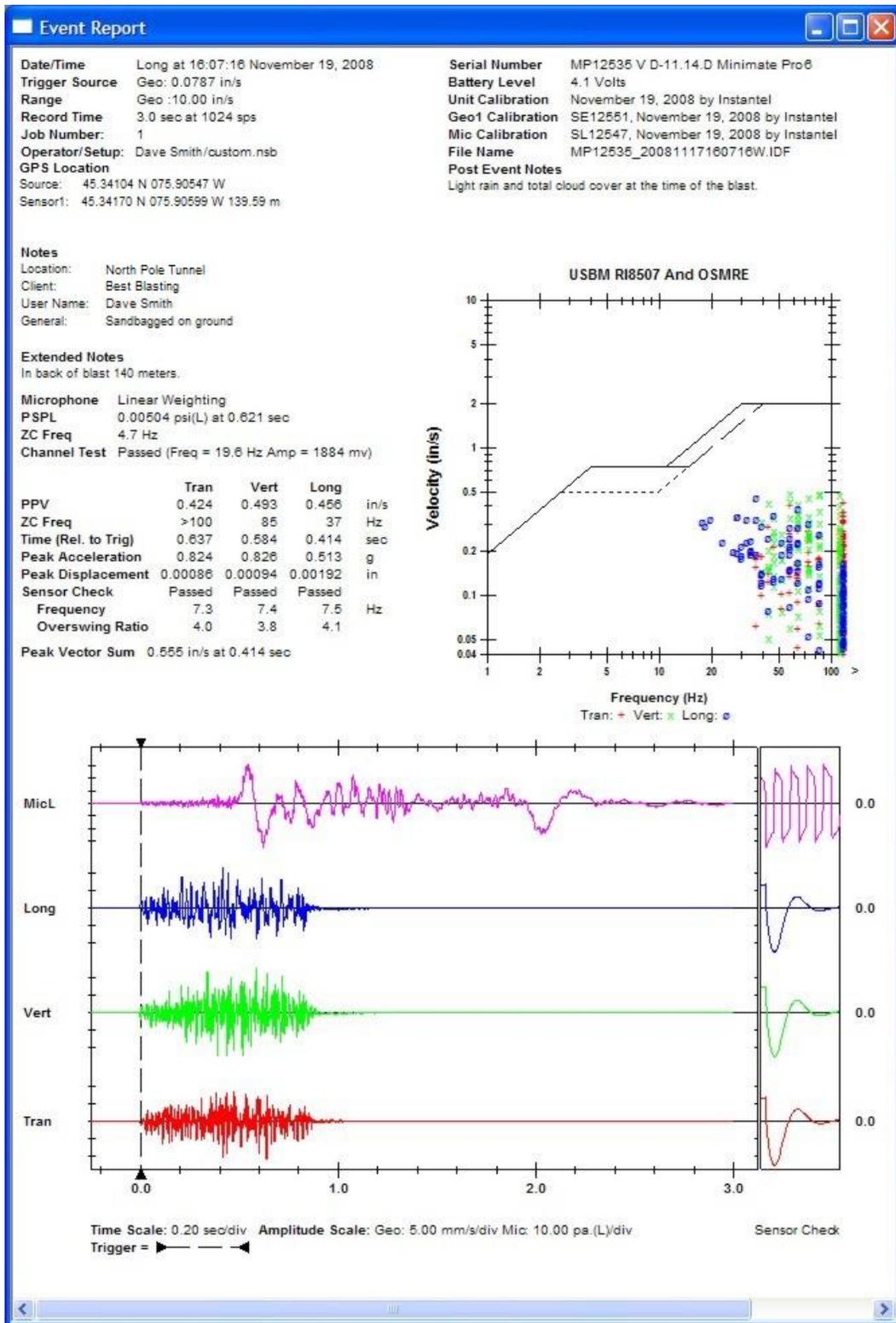
Notes:

9.   UNIT MENU OVERVIEW

9.1. View Data Files

1.   From the **Main Display**, select the **Down Arrow** key on the unit to access **View Data Files**.

2.   A list of recorded Events will appear. Press the **Up** or **Down Arrow** keys on the unit to highlight and select **Next/Prev** Events. Press and hold the **Down** or **Up Arrow** key to scroll through Events more quickly. Each Event type that is recorded with a particular **Record Mode**, **Waveform** or **Histogram**, has a different icon:

SYMBOL REPRESENTING A RECORDED HISTOGRAM

NUMBER OF EVENT FILES

Date	Time	Setup	1 of 8
10/15/2008	10:12:49a	factory	
10/15/2008	10:14:19a	factory	
10/15/2008	12:17:09a	factory	
10/23/2008	02:33:15a	Reed Stone South Pit	
10/23/2008	02:35:15a	Reed Stone South Pit	

▲▼Next/Prev ▶Detail ✔Menu ✘Exit

SYMBOL REPRESENTING A RECORDED WAVEFORM or OPTIONAL SOUND LEVEL MICROPHONE

a.   Within the **View Data** window, select the **Right Arrow** key to display the **Detail** of a selected Event. Below is an example of the **Detail** feature for a *Waveform Event*:

i.   Press the **Right Arrow** key to review **More** data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:

Event, 12/15/2008, 1:24:05 PM		Factory
Operator:	P. Jones	
Trigger:	Manual	
Duration:	1.0 sec, Fixed	
Maximum Vib:	62.0 mm/s, 37 Hz	
Maximum OP:	55.5 Pa(L), 7.2 Hz	

▲▼Prev/Next ▶More ✔Menu ✘Back

ii.   Each Event has several pages of data. Continue to press the **Right Arrow** key to review more data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:

Vibration channel:	Tran	Vert	Long
PPV:	47.6	62.0	49.8 mm/s
ZC Frequency:	32	37	32 Hz
Peak Acceleration:	0.968	1.480	1.060 g
Peak Displacement:	0.226	0.273	0.230 mm
Sensor Check:	Pass	Pass	Pass

▶More ✘Back

Pressure Channel:	MicL
Weighting:	Linear
Peak Sound Pressure:	.0200 psi
ZC Frequency:	2 Hz
Sensor Check:	Pass

✘Back

b. Within the **View Data** window, select the **Right Arrow** key to display the **Detail** of a selected **Histogram** Event. Below is an example of the **Detail** feature for a *Histogram Event*:

```
Event, 10/15/2008, 2:55:04 PM                          Factory
Operator:              Richard Smith
Trigger:               5 sec. Interval
Duration:              10/15/2008 2:55:04 – 4 Intervals
Maximum Vib:           7.35, 2 Hz
Maximum OP:            0.00022, 17 Hz
       ▲▼Prev/Next   ▶More   ✔Menu   ✖Back
```

i. Press the **Right Arrow** key to review more data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:

```
Vibration channel:     Tran       Vert       Long
PPV:                   7.35       0.131      7.16 in./s
ZC Frequency:          2          18         2 Hz
Peak Acceleration:     1.62       0.104      1.07 g
Peak Displacement:     0.534      0.00679    0.445 inch
Sensor Check:          Pass       Pass       Pass
                             ▶More   ✖Back
```

ii. Each Event has several pages of data. Continue to press the **Right Arrow** key to review more data associated with the selected Event, or the **Cancel** key to go **Back** to the previous menu:
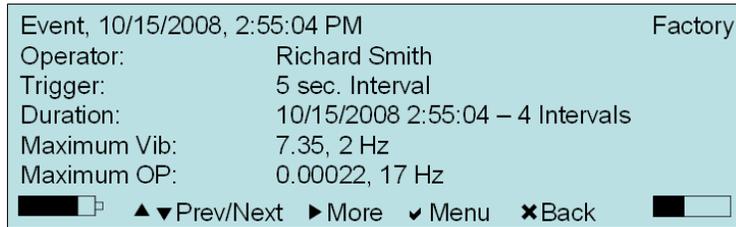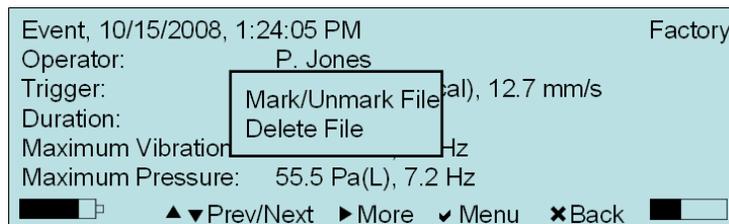
```
Pressure Channel:      MicL
Weighting:             Linear
Peak Sound Vibration:  0.00022 psi
ZC Frequency:          17 Hz
Sensor Check:          Pass

                             ✖Back
```

3. If you press **Cancel** to go **Back** while viewing the last page, the next page displays the first page that you viewed. Press the **Cancel** key to return to the **Main Display**.

    NOTE: The settings and data may vary from the examples shown above, dependent on the Setup File used or Event viewed.

4. While viewing the **Detail** of an Event, you are able to **Mark** the file for deletion, or remove the file while viewing it by pressing the **Enter** key to access the **Mark/Unmark File** and **Delete File** commands. If you delete a file while viewing the detail, you will be returned to the **View Data Files** screen.

```
Event, 10/15/2008, 1:24:05 PM                          Factory
Operator:                  P. Jones
Trigger:             ┌─────────────────┐al), 12.7 mm/s
Duration:            │ Mark/Unmark File│
Maximum Vibration    │ Delete File     │Hz
Maximum Pressure:    └─────────────────┘5.5 Pa(L), 7.2 Hz
       ▲▼Prev/Next   ▶More   ✔Menu   ✖Back
```

5. Access the **View Data Files** menu to **Mark/Unmark File** multiple files and subsequently **Delete** them, or **Delete All** files, whether they are marked or not. When an Event is highlighted and then **Marked**, an **Asterisk** will appear beside at the far left side of the screen.

    NOTE: A **Marked** file will have an asterisk placed to the left of the file within the **View Data** window, as shown below.

```
    Date          Time          Setup                    1 of 13
* ✈ 01/20/2008   10          Mark/Unmark File    y
   ⊥ 01/20/2008   10   Delete File              y
* ⊥ 01/20/2008   10   Delete Marked            y
* ✈ 01/20/2008   09   Delete All          Stone South Pit
   ✈ 01/20/2008   10.00.00a        Reed Stone South Pit
  ▮▮▮▯⊟      ▲▼ Next/Prev   ▶ Detail   ✔ Menu   ✖ Back  ▮▮▯▯
```
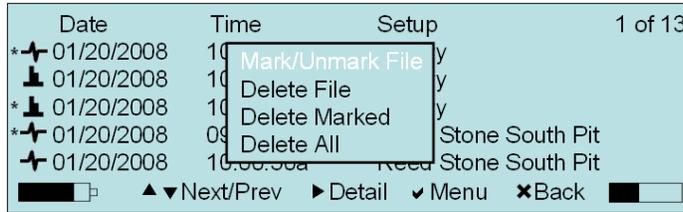
9.2. Select Setup File

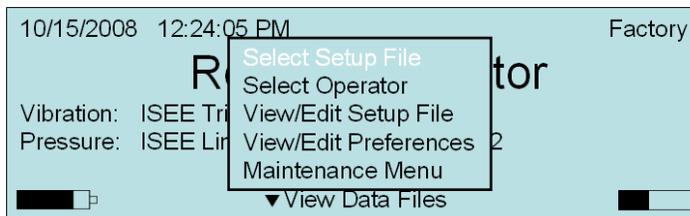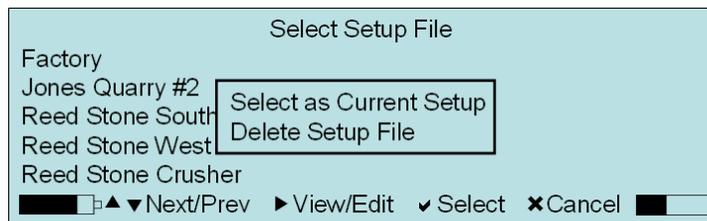Previously saved setup files can be selected as the default setup file or deleted. These files are created when you have edited and saved settings within the **View/Edit Setup File** menu, or when you have edited settings within the software and downloaded them to the unit.

1. From the main menu on the monitor, select the **Setup** key on the unit to access the main setup selection menu. Press the **Enter** key to access **Select Setup File**.

```
10/15/2008  12:24:05 PM                          Factory
                    R    Select Setup File    tor
                         Select Operator
Vibration:   ISEE Tri   View/Edit Setup File
Pressure:    ISEE Lir   View/Edit Preferences  2
                         Maintenance Menu
 ▮▮▮▯⊟              ▼ View Data Files             ▮▮▯▯
```
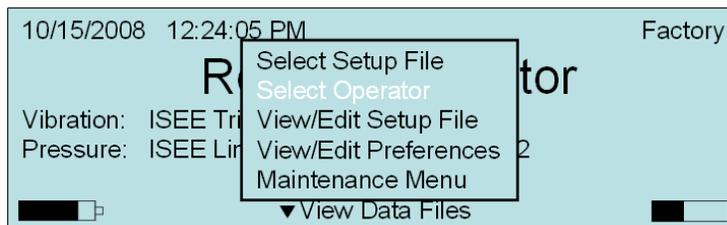
2. Press the **Up** or **Down Arrow** keys on the unit to highlight **Next/Prev Setup Files**. Highlight the **Setup** file that you want to use or delete. Press the **Enter** key to access the popup menu.

3. Press the **Up** or **Down Arrow** key to highlight **Select Current Setup**, to use the file as the default setup, or **Delete Setup File** to permanently remove the file from the unit. Press the **Cancel** key to exit the **Select Setup File** menu.

```
                    Select Setup File
Factory
Jones Quarry #2
Reed Stone South   Select as Current Setup
Reed Stone West    Delete Setup File
Reed Stone Crusher
 ▮▮▮▯⊟▲▼ Next/Prev   ▶ View/Edit   ✔ Select   ✖ Cancel ▮▮▯▯
```

9.3. Select Operator

Operator names can be deleted, renamed, or added. The current operator name is displayed on the Event Reports and at the upper right-hand corner of the Select Operator menu.

1. From the **Main Display** on the monitor, select the **Setup** key on the unit to access **Main Menu**. Press the **Down Arrow** key and highlight the **Select Operator** menu item. Press the **Enter** key to access **Select Operator**.

```
10/15/2008  12:24:05 PM                          Factory
                    R    Select Setup File    tor
                         Select Operator
Vibration:   ISEE Tri   View/Edit Setup File
Pressure:    ISEE Lir   View/Edit Preferences  2
                         Maintenance Menu
 ▮▮▯⊟              ▼ View Data Files             ▮▮▯▯
```

2. Press the **Up** or **Down Arrow** keys on the unit to highlight the **Next/Prev** operator.

3. Press the **Enter** key to **Select** an **Operator** for the unit.

```
Select Operator                          P. Jones
Operator 1
Operator 2
P. Jones
R. Philips
B. Phelps
    ▮▮▮▯⌐         ▲▼Next/Prev   ✔ Menu   ✖Cancel       ▮▮▯▯
```

4. Within the **Operator** screen, you can also **Add**, **Delete**, and **Rename** an operator. Select the **Enter** key to access the popup **Menu**. Access the **Rename Operators** command by highlighting the **Operator** and using the **Right Arrow** key to access the editing screen.

```
Select Operator                          P. Jones
Operator 1       ┌─────────────────────┐
Operator 2       │ Select as Operator  │
P. Jones         │ Add Operator        │
R. Philips       │ Delete Operator     │
B. Phelps        │ Rename Operator     │
    ▮▮▮▯⌐         ▲▼Next/Prev   ✔ Menu   ✖Cancel       ▮▮▯▯
```

   a. To use the **Select as Operator** command, press the **Up** or **Down Arrow** keys on the unit to highlight the operator you would like to select. Press the **Enter** key to access the **Menu**. Press the **Up** or **Down Arrow** keys on the unit to highlight **Select as Operator**. The unit will respond with a message confirming the selection and the name of the operator is shown in the upper right corner.

   b. To use the **Add Operator** command, Press the **Enter** key to access the **Menu**. Press the **Up** or **Down Arrow** keys on the unit to highlight **Add Operator**. Within the edit menu, use the **Right** and **Left Arrow** keys to navigate between the character fields, and the **Up** or **Down Arrow** keys to change the characters. Press the **Enter** key to **Save** the operator name, or the **Cancel** key to exit to the previous menu.

   c. To use the **Delete Operator** command, press the **Up** or **Down Arrow** keys on the unit to highlight the operator you would like to delete. Press the **Enter** key to access the **Menu**. Press the **Up** or **Down Arrow** keys on the unit to highlight **Delete Operator**. Press **Enter** to delete the selected operator.

   d. To use the **Rename Operator** command, press the **Up** or **Down Arrow** keys on the unit to highlight the operator you would like to rename. Press the **Enter** key to access the **Menu**. Press the **Up** or **Down Arrow** keys on the unit to highlight **Rename Operator**. Within the edit menu, use the **Right** and **Left Arrow** keys to navigate between the character fields, and the **Up** or **Down Arrow** keys to change the characters. Press the **Enter** key to **Save** the operator name, or the **Cancel** key to exit to the previous menu.
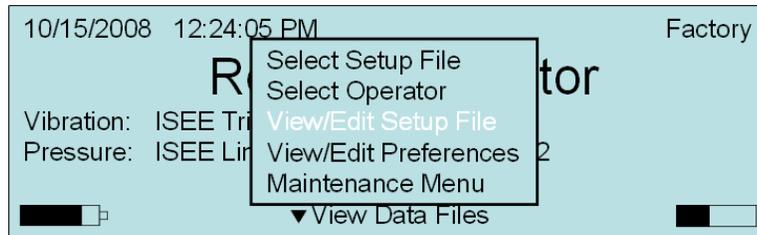
   NOTE: Operator names are limited to 15 characters.

9.4. View/Edit Setup File
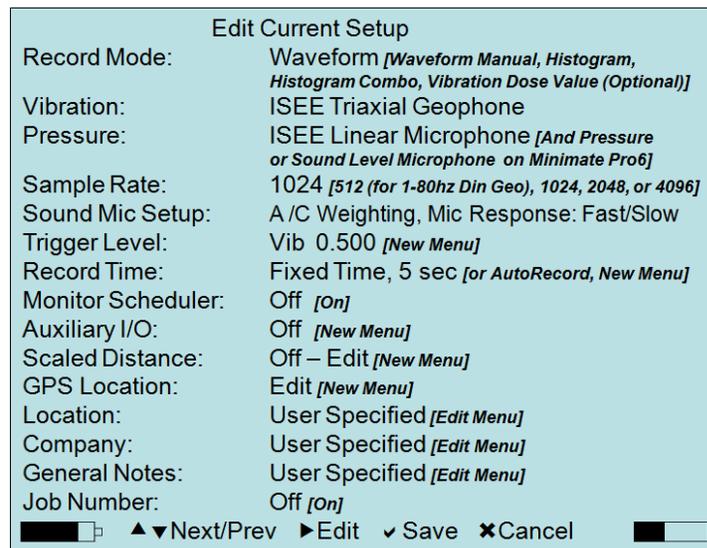
The **View/Edit Setup File** menu allows you to configure the **Record Mode** and related settings of the unit prior to monitoring an event. You can change the setups using the monitor commands or by using a personal computer running the software. This section outlines the procedures to change the setups using the **Minimate Pro** keyboard. For information on how to change the setups using a

personal computer and **THOR** or **Blastware**, refer to the **THOR** or **Blastware Operator Manual**.

1. From the main menu on the monitor, select the **Setup** key on the unit to access the main setup selection menu. Use **Down Arrow** key and highlight the **View/Edit Setup File** menu item. Press the **Enter** key to select **View/Edit Setup File**.

```
10/15/2008   12:24:05 PM                          Factory
                  ┌─────────────────────┐
              R   │ Select Setup File   │   tor
                  │ Select Operator     │
Vibration:  ISEE Tri│ View/Edit Setup File│
Pressure:   ISEE Lin│ View/Edit Preferences│ 2
                  │ Maintenance Menu    │
                  └─────────────────────┘
   ▬▬▬□        ▼ View Data Files          ▬▬▬ ▢
```

2. Press the **Up** or **Down Arrow** keys on the unit to highlight **Next/Prev Setup** options.
3. Press the **Right Arrow** key to select a **Setup** option for editing or viewing.
4. At any time, press the **Cancel** key to return to the previous screen.
5. The image below indicates in "*[…]*" the result of a **Right Arrow** key selection:

```
                     Edit Current Setup
Record Mode:          Waveform [Waveform Manual, Histogram,
                      Histogram Combo, Vibration Dose Value (Optional)]
Vibration:            ISEE Triaxial Geophone
Pressure:             ISEE Linear Microphone [And Pressure
                      or Sound Level Microphone  on Minimate Pro6]
Sample Rate:          1024 [512 (for 1-80hz Din Geo), 1024, 2048, or 4096]
Sound Mic Setup:      A /C Weighting, Mic Response: Fast/Slow
Trigger Level:        Vib  0.500 [New Menu]
Record Time:          Fixed Time, 5 sec [or AutoRecord, New Menu]
Monitor Scheduler:    Off  [On]
Auxiliary I/O:        Off  [New Menu]
Scaled Distance:      Off – Edit [New Menu]
GPS Location:         Edit [New Menu]
Location:             User Specified [Edit Menu]
Company:              User Specified [Edit Menu]
General Notes:        User Specified [Edit Menu]
Job Number:           Off [On]
▬▬▬□   ▲▼Next/Prev  ▶Edit  ✔ Save  ✖Cancel    ▬▬▬ ▢
```

9.4.1. Record Mode

The **Minimate Pro** offers the following recording modes: **Waveform**, **Waveform Manual**, **Histogram**, **Histogram Combo**, and the optional **Vibration Dose Value (VDV)**, available with **THOR** or the **Blastware Advanced Module**.

A **Record Mode** determines how the **Minimate Pro** records Events. Refer to **Trigger Level**, **Record Time**, and **Timer Mode**, for additional parameters that determine how, when and the duration the unit records an Event or series of Events. A **Record Mode** can be activated at the unit by pressing the **Start Monitor** key at the main display, or remotely through cable or modem communications within the software**,** by selecting **Unit > Monitor > Start Monitor**. Refer to these options within the **THOR** or **Blastware Operator Manual**.

Each **Record Mode** is described in detail below:
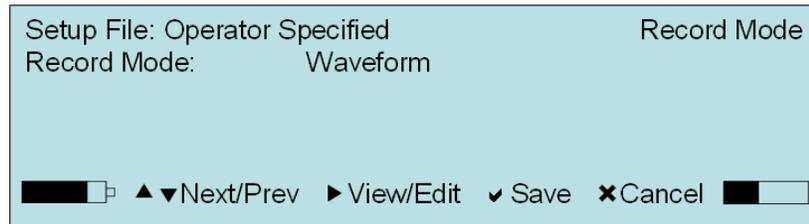
(1)   **Record Mode - Waveform**

Use **Waveform Record Mode** to record multiple Events automatically; the unit monitors activity, waiting for an Event to exceed the preset **Trigger Level**, records the data,

displays the results, and continues to monitor, ready to record following Events. The monitor records all Events whose activity exceeds a preset **Trigger Level**.

Use the **Waveform Record Mode** in conjunction with the **Scheduler** feature to record in the future, **Once, Daily**, **Weekly**, repeated as required, or set it to **Off** and record continuously based on the **Trigger Level** – the monitor records all Events whose activity exceeds the preset **Trigger Level** for the ISEE/DIN Geophone(s) and/or Linear Microphone.

(1)1. *To select the Waveform Record Mode:*

1. Within the **Edit Current Setup** menu, press the **Up** or **Down** key to locate and highlight the **Record Mode** menu option.
2. Press the **Right Arrow** key to access the menu. Continue to press the **Right Arrow** key until the **Record Mode** displays **Waveform**. The following menu will be displayed:

```
Setup File: Operator Specified               Record Mode
Record Mode:          Waveform



   ▮▮▮▯⌐  ▲▼Next/Prev   ▶ View/Edit   ✔ Save   ✖ Cancel  ▮▮▮▯
```
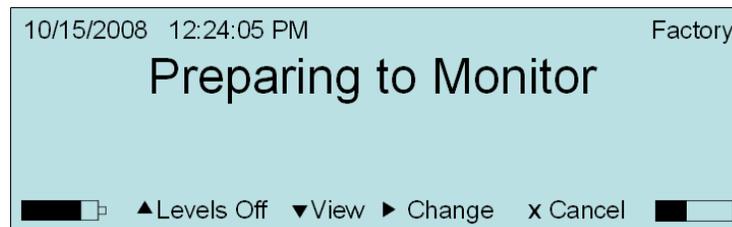
3. Press the **Enter** key to **Save** the new **Record Mode** setting.
4. Press the **Enter** key to **Save** the new **Current Setup** by overwriting the name displayed, or by creating a new **Setup File** name.
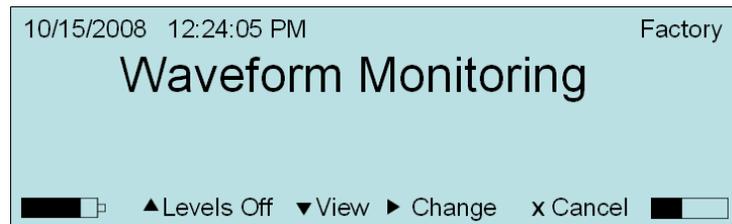5. Press the **Cancel** key to return to the **Ready to Monitor** display.

(1)2. *Dynamic Recording Information – Waveform Record Mode*

Viewing the **Dynamic Recording Information** displayed during the recording of a **Waveform** Event:

1. Once the **Record Mode** has been selected and the Event recording begins, the unit will briefly display the following message:
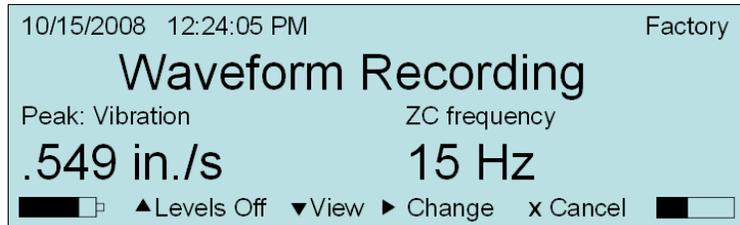
```
10/15/2008   12:24:05 PM                          Factory
               Preparing to Monitor



   ▮▮▮▯⌐   ▲Levels Off   ▼View  ▶ Change   x Cancel   ▮▮▮▯
```

2. The unit will then enter **Waveform Record Mode** and begin monitoring for Events:

```
10/15/2008   12:24:05 PM                          Factory
               Waveform Monitoring



   ▮▮▮▯⌐   ▲Levels Off   ▼View  ▶ Change   x Cancel   ▮▮▮▯
```
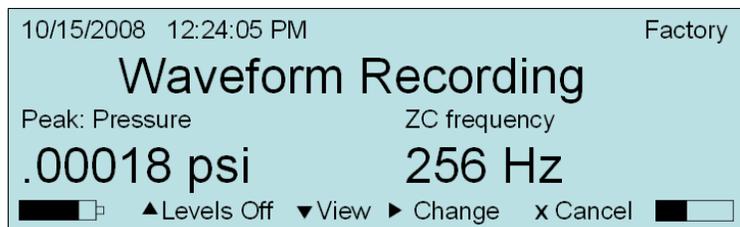
NOTE: A message, **Sensor Check**, will appear if it has been activated in the **Preferences** menu. Refer to **Sensor Check** under the **View/Edit Preferences** section of this manual to learn more about the feature and to determine when it will be activated. The **Sensor Check** setting will determine when it will notify

that it is occurring, **Before Monitoring** or **After Event**, or not at all if it is **Disabled**.

3. During recording, the **Peak** results and **Zero Crossing (ZC)** Frequency of the recorded Event appear on the display, as shown below:

    ```
    10/15/2008   12:24:05 PM                          Factory
                  Waveform Recording
    Peak: Vibration                    ZC frequency
     .549 in./s             15 Hz
    ▬▬▯   ▲Levels Off  ▼View  ▶ Change  ✗ Cancel  ▬▬▯
    ```

4. Press the **Right Arrow** to **Change** between **Peak Vibration** (shown above) and **Peak Overpressure** results. Below is an example of the **Peak: Pressure** and **ZC Frequency** readouts that are dynamically displayed:

    ```
    10/15/2008   12:24:05 PM                          Factory
                  Waveform Recording
    Peak: Pressure                     ZC frequency
     .00018 psi            256 Hz
    ▬▬▯   ▲Levels Off  ▼View  ▶ Change  ✗ Cancel  ▬▬▯
    ```

    NOTE: There is a 1/3 second delay between an Event ending and the level data being displayed. If an Event is triggered during that delay the display is not updated until the delay has passed.
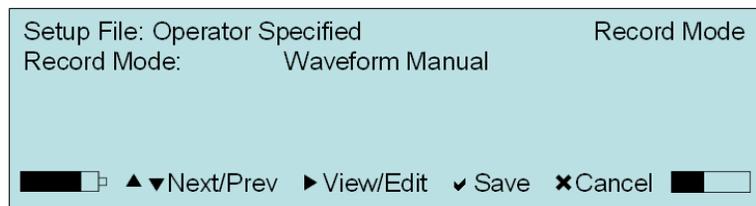
5. At any time, during, before or after recording, you can push the **Up Arrow** key to turn **Levels Off** and the display will no longer be updated with the **Peak** and **ZC Frequency** information. Press the **Up Arrow** key to turn them on again.

(2)   **Record Mode - Waveform Manual**

Use **Waveform Manual Record Mode** option and **Start Monitor** key if automatic triggering is unreliable, due to excessive wind or nearby vehicle activity, or to record the background noise level in the vicinity of a site.
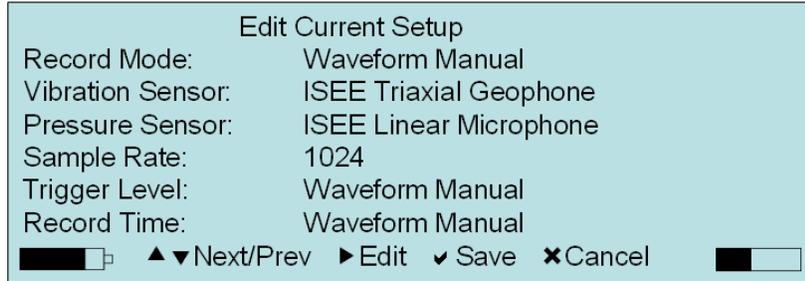
(1)1.   To select the Waveform Manual Record Mode:

1. Within the **Edit Current Setup** menu, press the **Up** or **Down** key to locate and highlight the **Record Mode** menu option.
2. Press the **Right Arrow** key to access the menu. Continue to press the **Right Arrow** key until the **Record Mode** displays **Waveform Manual**. The following menu will be displayed:

    ```
    Setup File: Operator Specified                    Record Mode
    Record Mode:               Waveform Manual



    ▬▬▯   ▲▼Next/Prev   ▶View/Edit   ✔ Save   ✗Cancel  ▬▬▯
    ```

3. Press the **Enter** key to **Save** the new **Record Mode** setting.

4. Note the changes within the **Edit Current Setup** menu. The **Record Mode**, **Trigger Level**, and **Record Time** have all changed to **Waveform Manual** settings:
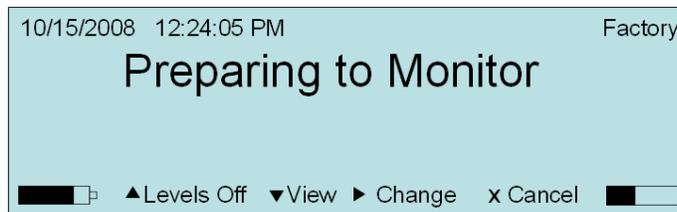


```
                    Edit Current Setup
Record Mode:            Waveform Manual
Vibration Sensor:       ISEE Triaxial Geophone
Pressure Sensor:        ISEE Linear Microphone
Sample Rate:            1024
Trigger Level:          Waveform Manual
Record Time:            Waveform Manual
 ■■■□  ▲▼Next/Prev  ▶Edit  ✔Save  ✖Cancel  ■■□
```

5. Press the **Enter** key to **Save** the new **Record Mode** setting.
6. Press the **Enter** key again to **Save** the new **Current Setup** by overwriting the name displayed, or by creating a new **Setup File** name.
7. Press the **Cancel** key to return to the **Ready to Monitor** display.
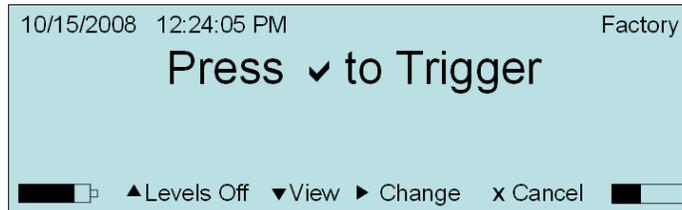
(1)2. *Dynamic Recording Information –Waveform Manual Record Mode*

Viewing the **Dynamic Recording Information** displayed during the recording of a **Waveform Manual** Event:

1. Once the **Record Mode** has been selected and the **Event** recording begins, the unit will briefly display the following message:
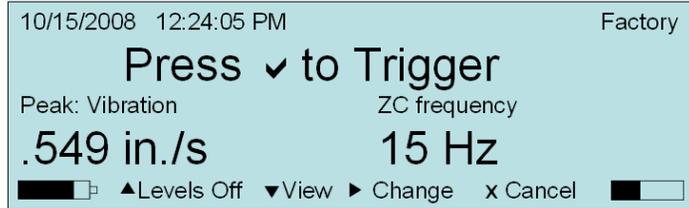


```
10/15/2008  12:24:05 PM                      Factory

           Preparing to Monitor


 ■■■□  ▲Levels Off  ▼View  ▶ Change  x Cancel  ■■□
```

2. For **Waveform Manual**, the unit then displays the following message:


```
10/15/2008  12:24:05 PM                      Factory

           Press ✔ to Trigger


 ■■■□  ▲Levels Off  ▼View  ▶ Change  x Cancel  ■■□
```

Press the **Enter** key to **Trigger** the recording process manually if you have selected the **Waveform Manual Record Mode**, otherwise the unit will start monitoring using the parameters set in the **Setup** and **Preferences** menus, such as the **External Trigger** option.

NOTE: A message, **Sensor Check**, will appear if it has been activated in the **Preferences** menu. Refer to **Sensor Check** under the **View/Edit Preferences** section of this manual to learn more about the feature and to determine when it will be activated. The **Sensor Check** setting will determine when it will notify that it is occurring, **Before Monitoring** or **After Event**, or not at all if it is **Disabled**.

3. After pressing **Cancel**, the **Peak** results and **Zero Crossing (ZC)** Frequency of the recorded Event appear on the display. Press the **Right Arrow** to **Change** between **Peak Vibration** and **Peak Overpressure** results. Below is an example of the two **Peak** and **ZC Frequency** readouts that are dynamically displayed:

```
10/15/2008  12:24:05 PM                              Factory

        Press ✔ to Trigger
Peak: Overpressure              ZC frequency

.00018 psi                      256 Hz
   ▇▇▇▢        ▲Levels Off  ▼View  ▶ Change   x Cancel   ▇▇▢
```

```
10/15/2008  12:24:05 PM                              Factory

        Press ✔ to Trigger
Peak: Vibration                 ZC frequency

.549 in./s                      15 Hz
   ▇▇▇▢        ▲Levels Off  ▼View  ▶ Change   x Cancel   ▇▇▢
```

4. After recording, you can push the **Up Arrow** key to turn **Levels Off** and the display will no longer show the **Peak** and **ZC Frequency** information. Press the **Up Arrow** key to turn them on again.

5. Press **Cancel** to return to the **Main Display**.

(3)   **Record Mode – Histogram**

Use the **Histogram Record Mode** for long-term recording periods such as monitoring of pile driving operations.

In **Histogram Record Mode**, the unit stores summary information in intervals, determined by the **Interval Size** setting, located within the **Record Mode** menu. The unit continues to sample data continuously at the chosen sample rate but only stores the relevant peaks for the selected **Interval Size**. This reduces the data recorded and greatly increases the monitor storage capacity. For each interval, the monitor calculates the maximum peaks, the frequency of the largest peak, and the peak vector sum. For each channel, the maximum peak and its frequency are calculated. Also the largest peak vector sum is calculated over the entire Event.

NOTE: The **Histogram Record Mode** consumes more battery power than other record modes. We recommend connecting a monitor to the supplied AC adapter or an external 12 VDC power supply.

NOTE: If you have the **Ethernet®** communication cable and **THOR** or **Blastware Advanced Module**, you can view Histogram data in real-time. Refer to that feature section for more information.

To select the Histogram Record Mode:

1. Within the **Edit Current Setup** menu, press the **Up** or **Down** key to locate and highlight the **Record Mode** menu option.

2. Press the **Right Arrow** key to access the menu. Continue to press the **Right Arrow** key until the **Record Mode** displays **Histogram**. The following menu will be displayed:

```
Setup File: Operator Specified              Record Mode
Record Mode:        Histogram
Interval Size:



   ▇▇▇▢    ▲ ▼Next/Prev   ▶View/Edit   ✔ Save   ✖Cancel   ▇▇▢
```
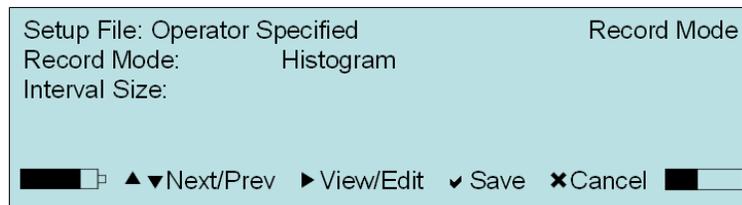
3. Press the **Right Arrow** key until the **Histogram** option appears.

4. Press the **Down Arrow** key and highlight **Interval Size**.

5. Press the **Right Arrow** key to access the editing function. Press the **Up** or **Down** Arrow key to modify the **Interval Size**.
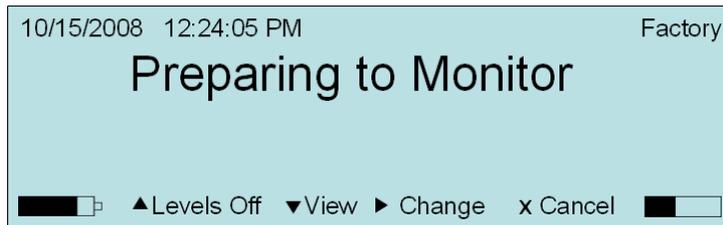
NOTE: The **Interval Size** may be set from 2 – 30 in seconds, or 1 – 60 in minutes.

6. Press the **Enter** key to **Save** the new **Interval Size** setting.
7. Press the **Enter** key again to **Save** the new **Record Mode** setting.
8. Press the **Enter** key again to **Save** the new **Current Setup** by overwriting the name displayed, or by creating a new **Setup File** name.
9. Press the **Cancel** key to return to the **Ready to Monitor** display.

(1)1. Dynamic Recording Information – Histogram Record Mode

Viewing the **Dynamic Recording Information** displayed during the recording of a **Histogram** Event:

1. Once the **Record Mode** has been selected and the Event recording begins, the unit will briefly display the following message:


```
10/15/2008   12:24:05 PM                        Factory

              Preparing to Monitor



        ▲Levels Off   ▼View  ▶ Change   x Cancel
```

NOTE: A message, **Sensor Check**, will appear if it has been activated in the **Preferences** menu. Refer to **Sensor Check** under the **View/Edit Preferences** section of this manual to learn more about the feature and to determine when it will be activated. The **Sensor Check** setting will determine when it will notify that it is occurring, **Before Monitoring** or **After Event**, or not at all if it is **Disabled**.

2. The unit then begins to monitor using the parameters set in the **Setup** and **Preferences** menus:


```
10/15/2008   12:24:05 PM                        Factory
              Histogram Recording
Peak: Vibration                     ZC frequency
.0320 in./s                 2 Hz
        ▲Levels Off   ▼View  ▶ Change   x Cancel
```
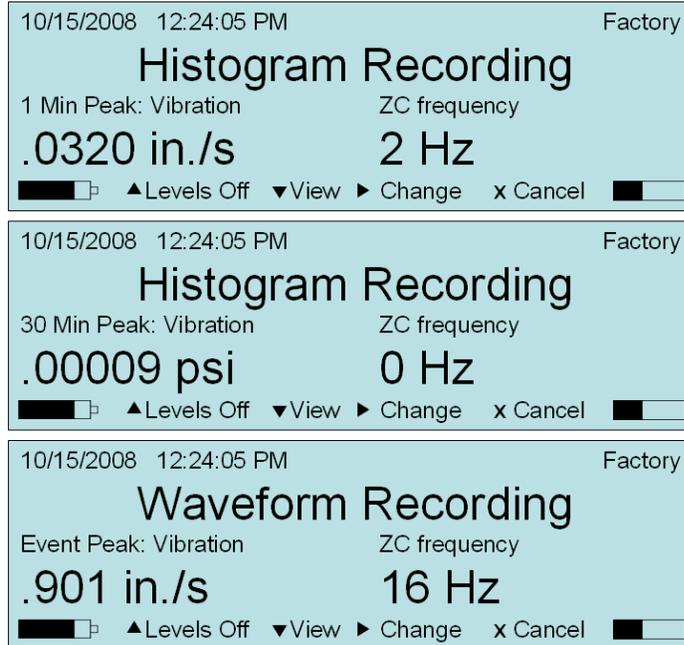
3. During recording, the **Peak** results and **Zero Crossing (ZC) Frequency** of the recorded Event appear on the display, as shown above.

4. Press the **Right Arrow** to **Change** between **Peak Vibration** and **Peak Overpressure** results. Below is an example of the **Peak** and **ZC Frequency** readouts that are dynamically displayed – notice that the **Pressure** units have changed from **in./s**, shown in the image above, to **psi**:


```
10/15/2008   12:24:05 PM                        Factory
              Histogram Recording
Peak: Pressure                     ZC frequency
.357 psi                 0 Hz
        ▲Levels Off   ▼View  ▶ Change   x Cancel
```

5. If the **Interval Size** within the **Edit Current Setup > Record Mode** menu has been set to over 30 seconds, then the **Event Peak: Vibration**, **1 Min. Peak: Vibration**, and **30**

Second Peak: Vibration values can be viewed by pressing the **Right Arrow** key for each, as shown below:

```
┌──────────────────────────────────────────────┐
│ 10/15/2008   12:24:05 PM            Factory    │
│            Histogram Recording                 │
│ 1 Min Peak: Vibration        ZC frequency      │
│ .0320 in./s              2 Hz                  │
│ ▪▪▫  ▲Levels Off  ▼View  ▶ Change  x Cancel ▪▪▫│
└──────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────┐
│ 10/15/2008   12:24:05 PM            Factory    │
│            Histogram Recording                 │
│ 30 Min Peak: Vibration       ZC frequency      │
│ .00009 psi               0 Hz                  │
│ ▪▪▫  ▲Levels Off  ▼View  ▶ Change  x Cancel ▪▪▫│
└──────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────┐
│ 10/15/2008   12:24:05 PM            Factory    │
│            Waveform Recording                  │
│ Event Peak: Vibration        ZC frequency      │
│ .901 in./s               16 Hz                 │
│ ▪▪▫  ▲Levels Off  ▼View  ▶ Change  x Cancel ▪▪▫│
└──────────────────────────────────────────────┘
```

(4)   **Record Mode - Histogram Combo**

Use the **Histogram Combo Record Mode** for long-term recording periods such as monitoring of pile driving where you may have larger amounts of time between each pile driving operation.

This **Record Mode** creates a waveform during recording if the signal exceeds the waveform trigger level. The waveform Event is saved as a separate file while the histogram Event file remains continuous. The **Auxiliary Trigger** is disabled during histogram combo mode, and the **Record Time > Record Stop Mode** must be set to **Fixed**.

In **Histogram Combo Record Mode**, the unit stores summary information in intervals, determined by the **Interval Size** setting, located within the **Record Mode** menu. The unit continues to sample data continuously at the chosen sample rate but only stores the relevant peaks for the selected Interval Size. This reduces the data recorded and greatly increases the monitor storage capacity. For each interval, the monitor calculates the maximum peaks, the frequency of the largest peak, and the peak vector sum. For each channel, the maximum peak and its frequency are calculated. Also the largest peak vector sum is calculated over the entire Event.

NOTE: The **Histogram Combo Record Mode** consumes more battery power than other record modes. We recommend using an AC adapter or an external 12 VDC power supply.

(1)1.   To select the Histogram Combo Record Mode:

1.   Within the **Edit Current Setup** menu, press the **Up** or **Down** key to locate and highlight the **Record Mode** menu option.
2.   Press the **Right Arrow** key to access the menu. Continue to press the **Right Arrow** key until the **Record Mode** displays **Histogram Combo**:

```
Setup File: Operator Specified                    Record Mode
Record Mode:              Histogram Combo
Interval Size:           5 sec


   ▬▬▯   ▲ ▼Next/Prev   ▶ View/Edit   ✔ Save   ✖ Cancel   ▬▯▯
```

3. Press the **Down Arrow** key and highlight **Interval Size**.
4. Press the **Right Arrow** key to access the editing function. Press the **Up** or **Down** Arrow key to modify the **Interval Size**.
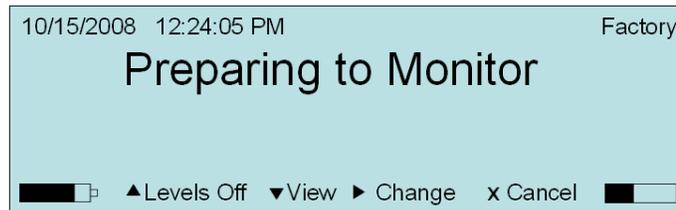5. Press the **Enter** key to **Save** the new **Interval Size** setting.

NOTE: The **Interval Size** may be set from 2 – 30 in seconds, or 1 – 60 in minutes.

6. Press the **Enter** key again to **Save** the new **Record Mode** setting.
7. Press the **Enter** key again to **Save** the new **Current Setup** by overwriting the name displayed, or by creating a new **Setup File** name.
8. Press the **Cancel** key to return to the **Ready to Monitor** display.

(1)2.   Dynamic Recording Information – Histogram Combo Record Mode

Viewing the **Dynamic Recording Information** displayed during the recording of a **Histogram Combo** Event:

1. Once the **Record Mode** has been selected and the **Event** recording begins, the unit will briefly display the following message:

```
10/15/2008  12:24:05 PM                              Factory

            Preparing to Monitor



   ▬▬▯   ▲Levels Off   ▼View   ▶ Change   x Cancel   ▬▯▯
```

NOTE: A message, **Sensor Check**, will appear if it has been activated in the **Preferences** menu. Refer to **Sensor Check** under the **View/Edit Preferences** section of this manual to learn more about the feature and to determine when it will be activated. The **Sensor Check** setting will determine when it will notify that it is occurring, **Before Monitoring** or **After Event**, or not at all if it is **Disabled**.

2. The unit then begins to monitor using the parameters set in the **Setup** and **Preferences** menus:

```
10/15/2008  12:24:05 PM                              Factory
            Histogram Recording
Peak: Vibration              ZC frequency
.0320 in./s                  2 Hz
   ▬▬▯   ▲Levels Off   ▼View   ▶ Change   x Cancel   ▬▯▯
```

3. During recording, the **Peak** results and **Zero Crossing (ZC) Frequency** of the recorded Event appear on the display, as shown above.

4. Press the **Right Arrow** to **Change** between **Peak Vibration** and **Peak Overpressure** results. Below is an example of the **Peak** and **ZC Frequency** readouts that are dynamically displayed – notice that the **Pressure** units have changed from **in./s**, shown in the image above, to **psi**:

```
10/15/2008  12:24:05 PM                    Factory
              Histogram Recording
Peak: Vibration              ZC frequency
 .0320 in./s                 2 Hz
■■■▯          ▲Levels Off  ▼View  ▶ Change  x Cancel  ■▭
```

5. If the **Interval Size** within the **Edit Current Setup > Record Mode** menu has been set to over 30 seconds, then the **Event Peak: Vibration**, **1 Min. Peak: Vibration**, and **30 Second Peak: Vibration** values can be viewed by pressing the **Right Arrow** key for each, as shown below:

```
10/15/2008  12:24:05 PM                    Factory
              Histogram Recording
1 Min Peak: Vibration          ZC frequency
 .0320 in./s                 2 Hz
■■■▯        ▲Levels Off  ▼View  ▶ Change  x Cancel  ■▭
```

```
10/15/2008  12:24:05 PM                    Factory
              Histogram Recording
30 Min Peak: Vibration         ZC frequency
 .00009 psi                  0 Hz
■■■▯        ▲Levels Off  ▼View  ▶ Change  x Cancel  ■▭
```

```
10/15/2008  12:24:05 PM                    Factory
              Waveform Recording
Event Peak: Vibration          ZC frequency
 .901 in./s                  16 Hz
■■■▯        ▲Levels Off  ▼View  ▶ Change  x Cancel  ■▭
```

6. If a **Waveform** recording is triggered, then the information for **Pressure** and **Vibration** is also available while the **Waveform Recording** message is displayed:

```
10/15/2008  12:24:05 PM                    Factory
              Waveform Recording
Peak: Vibration              ZC frequency
 .901 in./s                  16 Hz
■■■▯        ▲Levels Off  ▼View  ▶ Change  x Cancel  ■▭
```

```
10/15/2008  12:24:05 PM                    Factory
              Waveform Recording
Peak: Pressure               ZC frequency
 .357 psi                    0 Hz
■■■▯        ▲Levels Off  ▼View  ▶ Change  x Cancel  ■▭
```

(5)   **Record Mode - Vibration Dose Value (VDV) [Optional]**

The optional **Vibration Dose Value** (**VDV**) **Record Mode** is available on the unit with **THOR** or the **Blastware Advanced Module** software. Follow the instructions in the **THOR** or **Blastware Operator Manual** for **Reloading the Operating System** of the **Minimate Pro**, which will also load the **VDV** recording mode into the unit if it is not already there.

The **VDV** monitoring option is used to measure and determine whole-body vibration based on a **Frequency Weighting** file that is downloaded from **THOR** or **Blastware**. The **VDV Record Mode** will not be allowed unless a **Frequency Weighting** file is downloaded to the unit. Your geographic location and the type of vibration that you are monitoring will determine which **Frequency Weighting** file that you choose to use during the monitoring session – the frequency range of the data collected is from 1 to 80 Hz, therefore the **Instantel 1-80 Hz DIN Geophone** (Part No. 720A2003) is required for this type of recording, as the sample rate is reduced to 512 s/s. Multiple **VDV** frequency weight files may be downloaded to the monitor using **THOR** or **Blastware**. Refer to the **THOR** or **Blastware Operator Manual** for more information on how to download weight files to the unit.

While monitoring, the unit differentiates the velocity data into acceleration, applies the frequency weighting and then calculates the **VDV** and **Root Mean Square** (**RMS**) values. The unit displays the **VDV** and **RMS** values every ten seconds while recording, and stores the final calculations as part of the file and Event Report.

There are two primary standards for determining and evaluating whole-body vibration, as follows:

BS-6841	Measurement and evaluation of human exposure to whole-body mechanical vibration and repeated shock.
ISO-2631	Evaluation of human exposure to whole body vibration.

These **Series IV** units are capable of continuously monitoring full waveform data for 24 hours; the daytime **VDV** monitoring is performed on the vertical channel (7:00 AM to 11:00 PM) while the nighttime **VDV** monitoring is performed on two horizontal channels (11:00 PM to 7:00 AM) – the same or different Frequency Weight file can be used for each of these monitoring periods.

NOTE: The **VDV Record Mode** consumes more battery power than other record modes. We recommend connecting the monitor to the supplied AC adapter or an external 12 VDC power supply.

(1)1.   To select the Vibration Dose Value Record Mode:

1. Within the **Edit Current Setup** menu, press the **Up** or **Down** key to locate and highlight the **Record Mode** menu option.
2. Press the **Right Arrow** key to access the menu. Continue to press the **Right Arrow** key until the **Record Mode** displays **Vibration Dose Value**. The following menu will be displayed:


```
Setup File: Operator Specified                    Record Mode
Record Mode:          Vibration Dose Value
VDV Weight File:      [Selectable – Downloaded from Blastware Advanced]
Monitor Channels:    [Selectable]

         ⯈  ▲▼Next/Prev   ▶View/Edit   ✔Save   ✖Cancel
```

3. Within the **Record Mode** menu, press the **Up** or **Down** key to locate and highlight the **Record Mode** menu option.
4. Press the **Right Arrow** key until the **Vibration Dose Value** option appears.

5. Press the **Up** or **Down Arrow** key and highlight **VDV Weight File**.
6. Press the **Right Arrow** key to select one of the weight files. The following **VDV Weight Files** are available within **THOR** or **Blastware** for download to the unit: BW6841wb, BW6841wd, BW6841we, BW6841wf, BW6841wg, and ISO2631.

   Refer to each specific standard, **BS-6841** or **ISO-2631** for detailed information on each weighting file, in regards to the wb, wd, we, wf, wg, and wm names.

   NOTE: Multiple **VDV Weight Files** can be downloaded from the software. Refer to the **THOR** or **Blastware Operator Manual** for more information on how to download weight files.

7. Next, press the **Down Arrow** key to highlight **Monitor Channels**.
8. Press the **Right Arrow** key to select the channel(s) of the geophone that you wish to monitor (**Tran**, **Vert**, **Long**, **Tran/Vert**, **Vert/Long**, **Tran/Long** or **Tran/Vert/Long**). This selection should be based on the time of day you are monitoring.
9. Press the **Enter** key again to **Save** the new **Current Setup** by overwriting the name displayed, or by creating a new **Setup File** name.
10. Press the **Cancel** key to return to the **Ready to Monitor** display.

(1)2.   *Dynamic Recording Information – Vibration Dose Value Record Mode*

Viewing the **Dynamic Recording Information** displayed during the recording of a **Vibration Dose Value** recording session:

1. Once the **Record Mode** has been selected, select **Start Monitor.**

   NOTE: A message, **Sensor Check**, will appear if it has been activated in the **Preferences** menu. Refer to **Sensor Check** under the **View/Edit Preferences** section of this manual to learn more about the feature and to determine when it will be activated. The **Sensor Check** setting will determine when it will notify that it is occurring, **Before Monitoring** or **After Event**, or not at all if it is **Disabled**.

2. Every ten seconds the dynamic display will update the **Dose** and **RMS** values, with the final values stored with the **Event**. Press the **Right Arrow** key to toggle between **Tran Dose**, **Vert Dose**, and **Long Dose**, as shown below:
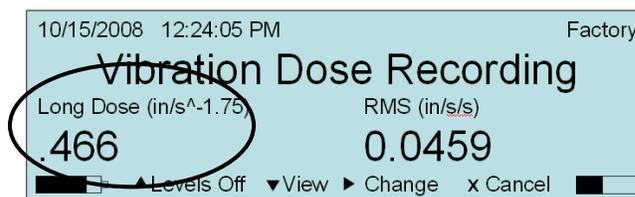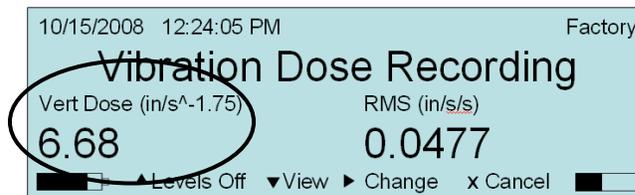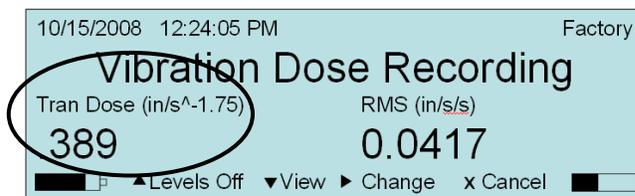
9.4.2. Vibration Sensor (Minimate Pro4 and Minimate Pro6)

The **Vibration Sensor** option represents **Channels 1−3**, and the connector is located on the side of the **Minimate Pro** and is labeled **Vibration**. The color of the label is blue.

(1)   Scroll down to highlight **Vibration Sensor.**

(2)   Press the **Right Arrow** key to either select the **ISEE** or **DIN Geophone** or turn the **Vibration** channel **Off**.

9.4.3. Pressure Sensor (Minimate Pro4)

The **Pressure Sensor** option represents **Channel 4**, and the connector is located on the side of the **Minimate Pro** and is labeled **Pressure**. The color of the label is red.

(1)   Scroll down to highlight **Pressure Sensor.**

(2)   Press the **Right Arrow** key to either select the **ISEE Linear Microphone** or turn the **Pressure** channel **Off**.

a. Pressure Sensor (Minimate Pro6)

The **Pressure Sensor** option represents Channels 4−6, and the connector is located on the side of the **Minimate Pro** and is labeled **Pressure**. On the **Minimate Pro6**, an ISEE or DIN Geophone, or ISEE Linear Microphone, may be attached. The color of the label is red and blue.

(1)   Scroll down to highlight **Pressure Sensor.**

(2)   Press the **Right Arrow** key to either select the **Linear Microphone**, **ISEE** or **DIN Geophone** or turn the **Pressure** Channel **Off**.

NOTE: The selected sensors within **View/Edit Setup File** should match what is attached to the unit. If the **Vibration Sensor** channel is **Off** and an **ISEE** or **DIN Geophone** is attached, or if it is **On**, and an **ISEE** or **DIN Geophone** is not attached but it appears in the setup file, the **Sensor Check** will return the message, "Sensor Detection Error – Attached Sensors do not match setup".

If you receive a **Sensor Detection Error**, you must decide whether or not to **Accept** or **Cancel** the setup and fix the issue. Suggested sensors and sample rates are also displayed in **THOR** or **Blastware** when you use the **Unit > Monitoring** dialog. Below are two examples of **Sensor Detection Error** and/or sample rate suggestions on the unit and within **Blastware**:

Blastware Example:

CHECK SENSOR OR SAMPLE RATE SETUP

Series IV Setup for Monitoring

	Sensors		Sample Rate (sps)		
Channel	Attached	Expected	Actual	Suggested	
1-3	ISEE Geophone	ISEE Geophone	2048	1024	Check
4-6	Linear Microphone	ISEE Geophone	2048	1024	Check

Accept Setup and Monitor   Cancel

MISMATCHED SENSOR ATTACHED TO UNIT

SUGGESTED SAMPLE RATE CONSERVES
MEMORY AND BATTERY LIFE

Minimate Pro Example:

Setup and Detected Sensor Mismatch

Vibration 1:	No Sensor	In Setup
	ISEE Triaxial Geophone	Detected
Vibration 2:	ISEE Triaxial Geophone	In Setup
	ISEE Linear Microphone	Attached

✖ Cancel   ✔ Accept Attached Sensors

THIS COLUMN INDICATES MISMATCHED SENSORS. FOR EACH
CHANNEL THE SENSOR THAT IS IN THE SETUP IS LISTED, AND
THEN WHAT IS ACTUALLY ATTACHED TO THE UNIT.

9.4.4. Sample Rate

The **Minimate Pro** offers a number of sample rates including **512**, **1024**, **2048**, and **4096**, available on all channels.

The choice of a sample rate depends on the type of monitoring you are conducting. Increasing the sample rate increases the accuracy of the waveform recording. For this reason, set the sample rate according to the location of the Geophone. For Near-Field monitoring, set the sample rate to **4096** samples per second. For Far-Field monitoring, set the sample rate to **1024** samples per second. Increasing the sample rate also increases the amount of memory required to store Events and therefore reduces the number of Events that can be stored on the monitor. A higher sample rate also reduces the battery charge at a greater rate.

The **512** samples per second range is available in all monitor modes, but only recommended for the 1 – 80 Hz DIN Geophone and the **VDV Record Mode**. It is the only sample rate available for **VDV** recording.

To choose a sample rate, press the **Setups** key and press the **Down Arrow** key until the **Edit/View Setup File** option is highlighted. Press the **Enter** key to access the **Edit Current Setup** menu. Using the **Down Arrow** key, scroll through the windows until **Sample Rate** is highlighted.

(1)   To edit the **Sample Rate,** press the **Right Arrow** key.

(2)   Continue to press the **Right Arrow** key to change the sample value.

(3)   Press the **Enter** key to **Save** the changes, or the **Cancel** key to return to the previous menu without saving the changes.

9.4.5. Trigger Level

The **Trigger Level** sets a threshold that must be exceeded by an Events activity before the monitor begins recording. Use your judgment when setting a trigger level. You must set the level high enough so the unit does not trigger on unwanted Events such as nearby vehicle traffic. At the same time, you have to set the trigger level low enough so that an Events activity exceeds the trigger level and starts the unit recording.

The **Trigger Level** settings also determines trigger source, which sets the **Minimate Pro** to trigger and start recording an Event automatically on ground vibrations, measured by the ISEE or DIN Geophone, or air pressure, measured by the ISEE Linear Microphone.

The **Minimate Pro** has three trigger source settings: **Vibration Trigger** alone, **Pressure Trigger** alone, or both **Vibration** and **Pressure Trigger** together. When you choose both, triggering occurs and recording begins if ground vibrations or air pressure exceeds the **Trigger Level** for either the ISEE or DIN Geophone, or the ISEE Linear Microphone.

```
Setup File:     Factory                          Trigger Level
Vibration Trigger:                       On [off]
Vibration 1 Trigger Level:               010.00 mm/s [Edit]
Pressure Trigger:                        On [off]
Pressure Trigger Level:                  000.25 pa [off]
   ◼◻      ▲▼ Next/Prev   ▶Edit   ✓Save  ✗Cancel    ◼◻
```

(1)   To set a **Trigger Level** for the Geophone, or **Vibration Trigger**, press the **Right Arrow** key to set the **Vibration Trigger** to **On**.

(2)   Set the **Vibration Trigger Level** in mm/s or in/s, dependent on the **Units** selected in the **View/Edit Preferences** menu, by selecting the **Right Arrow** key to edit the value. Press the **Right** and **Left Arrow** key to move from each value field. Press the **Up** or **Down Arrow** keys to change the value.

(3)   To set a **Pressure Trigger** level for the Linear Microphone, or **Pressure Trigger**, press the **Right Arrow** key to set the **Pressure Trigger** to **On**.

(4)   Set the **Pressure Trigger Level** in mm/s or psi, dependent on the units selected in the **View/Edit Preferences** menu, by selecting the **Right Arrow** key to edit the value. Press the **Right** and **Left Arrow** key to move from each value field. Press the **Up** or **Down Arrow** keys to change the value.

(5)   Press the **Enter** key to **Save** the changes, or the **Cancel** key to return to the previous menu without saving the changes.

NOTE: Refer to the **Auxiliary I/O** feature in this section for more information on alternative ways to trigger the **Minimate Pro** unit.

9.4.6. Record Time

Select the **Record Time** feature if using the **Waveform** or **Waveform Manual** recording modes. Within the **Record Time** feature, there are three options, **Record Stop Mode**, **Record Time**, and **Auto Window**, as shown below:


```
Setup File: factory.nsb                      Record Time
Record Stop Mode:       Fixed Time [Auto Record]
Record Time:            001 sec. [Edit]
Auto Window:            009 sec. [Edit]


  ■___▯    ▲ ▼Next/Prev   ▶View/Edit   ✔ Save   ✘Cancel  ▭
```

The **Record Stop Mode** sets how the unit stops recording after being triggered. You can choose between a **Fixed Time** setting and an **Auto Record** setting. **Fixed Time** sets the record time to a specified length. For example, you set the unit to record for two seconds; once the record time has elapsed, the unit stops recording. In **Auto Record** the unit continues to record **Event** activity as long as that activity remains above the trigger level. (Sufficient memory and battery power must be available). Recording stops at a specified period of time after the **Event** activity falls below the trigger level. The period of time is called the **Auto Window**.

Remember to set the **Record Time** long enough to record an entire Event but not too long to avoid recording unnecessary data and filling the unit memory. Set a Record Time for **Waveform** and **Waveform Manual** record modes.

A helpful rule of thumb when setting a **Record Time** for a blast Event is to add the delays between detonating holes or use the longest delay, then add one second for each one thousand feet (300 m) from the Event to the unit to account for the speed of sound. For example, in the figure below the minimum record time required is 1.1 seconds. To be on the safe side and ensure you record all of the Event activity, set the **Record Time** to 2.0 seconds. As there is no single method for setting a **Record Time**, use your knowledge and experience to determine the setting.

Record Time = 0.5 s (delay) + 0.6 s (Distance 600 ft./1000 ft.) = 1.1 s (total)
(=2.0 s rounded to the next highest second).
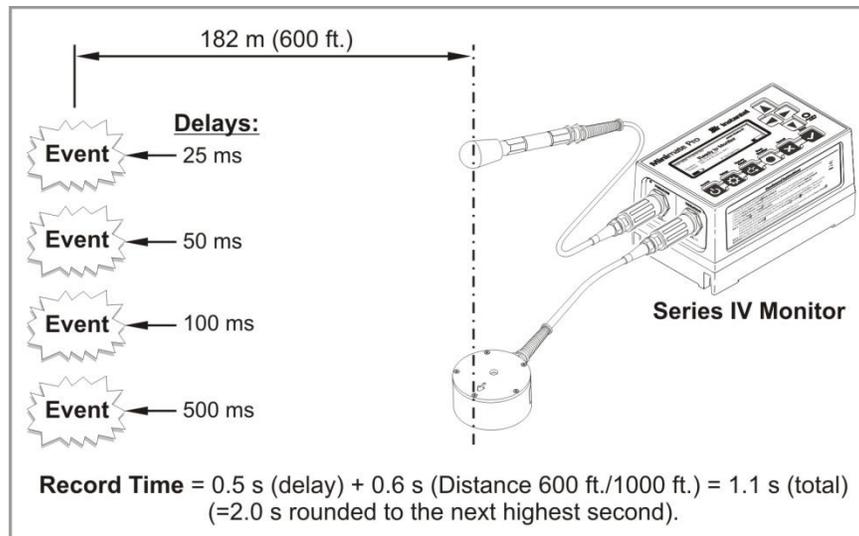
Calculating a Recording Time

The total **Record Time** available depends upon the amount of available memory. The unit checks your setup to determine the amount of available memory. If there is not enough memory, a warning message appears and the **Record Time** defaults to the maximum available. For approximate record times, refer to the table below:

Follow these steps to set the **Record Time** parameters:

   (1) Press the **Setup** key to access the **Main Menu**.

   (2) Press the **Down Arrow** key until **View/Edit Setup** is highlighted. Press the **Enter** key to access this menu selection.

   (3) Within the **Edit Current Setup** menu, press the **Down Arrow** key until the **Record Time** menu option is highlighted.

   (4) Press the **Right Arrow** key to access this menu selection.

   (5) The first selection is **Record Stop Mode**.

   (6) Press the **Right Arrow** key to toggle between **Auto Record** or **Fixed Time**.

   (7) Press the **Enter** key to **Save** the changes.

   (8) Use the **Down Arrow** keys to highlight **Record Time**.

   (9) Press the **Right Arrow** key to access the value field.

  (10) Press the **Up** or **Down Arrow** key to change the values within **Record Time**.

  (11) Press the **Enter** key to **Save** the changes.

  (12) Press the **Down Arrow** key to access the **Auto Window** setting.

  (13) Press the **Right Arrow** key to access the value field.

  (14) Press the **Up** or **Down Arrow** key to change the values within the **Auto Window** field.

  (15) Press the **Enter** key to **Save** the changes, or the **Cancel** key to return to the previous menu without saving the changes.

NOTE: Approximate Monitor Record Times are listed below for each **Channel** and associated **Sample Rate**:

Approximate Monitor Recording Times Displayed in Seconds					
Sample Rate	Channel 1	Channel 2	Channel 3	Channel 4	Channel 6
512	211296	105648	70432	52824	35216
1024	105648	52824	35216	26412	17608
2048	52824	26412	17608	13206	8804
4096	26412	13206	8804	6603	4402

Approximate Monitor Recording Times Displayed in Hours					
Sample Rate	Channel 1	Channel 2	Channel 3	Channel 4	Channel 6
512	58.7	29.3	19.6	14.7	9.8
1024	29.3	14.7	9.8	7.3	4.9
2048	14.7	7.3	4.9	3.7	2.4
4096	7.3	3.7	2.4	1.8	1.2

9.4.7. Monitor Scheduler

The **Monitor Scheduler** feature sets the **Minimate Pro** unit to automatically start monitoring sessions at a preset time using a series of setup files and, if required, the **Self Check** feature can be activated. The scheduler can be set for a one time session, daily, or weekly and repeated. Using the **Monitor Scheduler** extends the battery life by only monitoring the time periods when Events are scheduled to occur and not the time periods between Events. It allows for different monitoring **Record Modes** to be selected, too, as long as the sensors remain the same within each setup file used.

The settings for **Monitor Scheduler** are completed within the software and sent to the unit. Please refer to the software **Operator Manual** for more information on the **Monitor Scheduler** feature.

Ensure that the **Monitor Scheduler** is **On**, by activating it within the software, or on the monitor under **View/Edit Setup > Monitor Scheduler > On** with a key press of **Start Monitoring**. This feature can also be turned **Off** at these menu locations.

Once you have setup and started monitoring, you can stop recording at any time by pressing the **Cancel** key on the unit or **Stop Monitoring** from within the software.

(1)   Press the **Setup** key.

(2)   Press the **Down Arrow** key until **View/Edit Setup File** is highlighted.

(3)   Press the **Down Arrow** key until **Monitor Scheduler** is highlighted.

(4)   Press the **Right Arrow** key to toggle between **On** or **Off**.

(5)   Press the **Enter** key to **Save** the setting.

(6)   Press the **Enter** key to **Accept** the **Save Setup File** prompt, or use the **Up** and **Down Arrow** keys to change the name of the **Setup File** before saving.

(7)   Send a **Monitor Scheduler** setup from **THOR** or **Blastware**. Refer to the **THOR** or **Blastware Operator Manual** on how to setup and send a series of scheduled monitoring sessions.

(8)   Start the Monitor Scheduler session by activating it within the software, or on the monitor with a key press of **Start Monitoring**. It will appear as it does below until the first scheduled setup file is started, after which it will display the current monitor mode (e.g. **Waveform**, **Histogram**, or **Histogram Combo**):

```
11/10/2008   1:24:05 PM                          Factory
                  Monitor Scheduler




     ▭▬▯    ▲Levels Off   ▼View   ✔Change  ✖Cancel  ▬▬▯
```
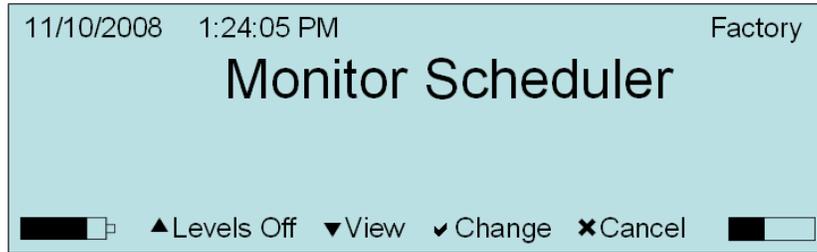
9.4.8. Auxiliary I/O

The **Auxiliary I/O** menu controls the triggering of an optional **Remote Alarm** (Part No. 711A1401) based on levels set for **Vibration** or **Pressure**, or for an **External Trigger**, using the optional **Wire Break/Make Trigger Cable** (Part No. 720A3501). Refer to the **Optional Features** section of this manual for more information.

The **Remote Alarm** sounds two alarms: **Warning** and **Alarm**. The warning alarm sounds when Event activity exceeds the **Vibration Trigger Level** or **Pressure Trigger Level**. The **Vibration Alarm Level** and /or the **Pressure Alarm Level** can be set to a higher level than the **Geophone Trigger Level** and the **Pressure Trigger Level**. This allows for the triggering of a second alarm at the higher level.

For example, in pile driving operations the remote alarm triggers a warning when activity exceeds the trigger level for the geophone, notifying the operator that the pile driving activity has exceeded the set level. The second alarm triggers when activity exceeds the **Vibration Alarm Level**, set to a higher level, notifying the operator that operations should cease immediately.

IMPORTANT: The **Remote Alarm** is not active until the **Start Monitor** key is pressed on the unit.

The optional **Remote Alarm** and **Wire Break/Make Trigger Cable** are shipped with instruction sheets.

When **External Trigger** is selected, the **Trigger Level** menu item will automatically reflect the change by placing an "A" after the sensor and threshold you want to trigger the recording, as shown below:

```
Setup File:     Factory                        Auxiliary I/O
Auxiliary I/O:          External Trigger
Warning Hold Time:    300 Seconds
Alarm Hold Time:      300 Seconds
Alarm On:             Vibration No      Pressure No
Vibration Alarm Level:  Disabled
Pressure Alarm Level:  Disabled
▭▬▯      ▲▼Adjust   ▶Edit   ✔Save   ✖Cancel   ▬▬▯
```

```
              Edit Current Setup
Record Mode:          Waveform
Vibration:            ISEE Triaxial Geophone
Pressure:             ISEE Linear Microphone
Sample Rate:         1024
Trigger Level:        Vib 0.500    0/P 0.01000  A
▭▬▯    ▲▼Next/Prev   ▶Edit   ✔Save   ✖Cancel   ▬▬▯
```

Follow the directions below to set the **Alarm Levels** within the **Auxiliary I/O** menu:

(1) From the **Main Display**, press the **Setup** key to access the **Main Menu**.

(2) Press the **Down Arrow** key on the unit to highlight the **View/Edit Current Setup** menu option.

(3) Press the **Down Arrow** key until the **Auxiliary I/O Levels** menu option is highlighted.

(4) Press the **Right Arrow** key to access the **Auxiliary I/O** menu, as shown below:

```
Setup File:     Factory                        Auxiliary I/O
Auxiliary I/O:          Off [Remote Alarm or External Trigger]
Warning Hold Time:      0 Seconds [Edit Value Menu]
Alarm Hold Time:        60 Seconds [Edit Value Menu]
Alarm On:               Vibration No [Yes] Pressure No [Yes]
Vibration Alarm Level: 7.00 in./s [Edit Value Menu]
Pressure Alarm Level: 210.8 [Edit Value Menu]
■■■□          ▲▼Adjust  ▶Edit  ✔Save  ✘Cancel      ■■□□
```
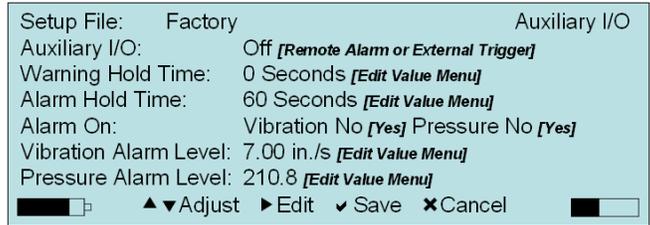
(5) To set the **Auxiliary I/O** feature, use the **Down Arrow** key to highlight the option, and then the **Right Arrow** key to toggle the feature between **Off**, **Remote Alarm**, or **External Trigger**.

(6) Determine how long you want the **Warning Alarm** and **Alarm Hold Time** to sound, and enter a value in the field to the right of these features by using the **Right Arrow** key to access the value editing field. Press the **Up** or **Down Arrow** key to change the value in each field. Jump between the fields by using the **Right** or **Left Arrow** keys. Press the **Enter** key to **Save** the edits to each selection. The **Warning Alarm** and **Alarm Hold Time** have a 300 second time limit (5 minutes). If it is set to "**0**" then the user will need to manually press the **Enter** key.

(7) Highlight the **Alarm On** option and press the **Right Arrow** key to change the options for which sensor(s) you want to trigger the alarm. Each key press will provide a new setting option, as follows:

Minimate Pro4 or **Minimate Pro6 with a Microphone and a Geophone:**

Vibration	No	Pressure	No
Vibration	Yes	Pressure	Yes
Vibration	No	Pressure	Yes
Vibration	Yes	Pressure	No

Minimate Pro6 with two Geophones:

Vibration	No	Vibration 2	No
Vibration	Yes	Vibration 2	Yes
Vibration	No	Vibration 2	Yes
Vibration	Yes	Vibration 2	No

(8) To set the **Vibration Level** value, use the **Down Arrow** key to highlight the option, and then the **Right Arrow** key to enter the edit menu, as shown below:

```
                Enter Vibration Alarm Level

                 Range  0.500 - 10.0 in./s
                        07.000


■■■□          ▲▼Change  ▶Edit  ✔Accept  ✘Cancel      ▭▭▭
```
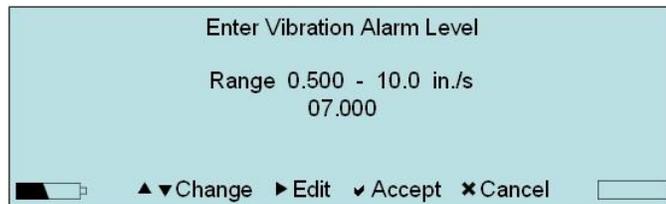
NOTE: If you are using a **Minimate Pro6** monitor with two geophones attached, than there are two options to set the **Vibration Alarm Level** for each

geophone attached, **Vibration 1 Level** or **Vibration 2 Level**.

(9)   Press the **Right Arrow** key to move the cursor within the value field, and the **Up** or **Down Arrow** key to **Change** the value setting.

(10)   Press the **Enter** key to **Accept** the new setting, or the **Cancel** key to exit the menu without saving the changes.

(11)   To set the **Vibration Level** value, use the **Down Arrow** key to highlight the option, and then the **Right Arrow** key to enter the edit menu, as shown below:

<div style="border:1px solid #000; padding:20px; max-width:500px; margin:auto; text-align:center; background:#d6e4e4;">

Enter Pressure Alarm Level

Range 176.8 - 148.0 in./s
0148.0

▲ ▼ Change ▶ Edit ✔ Accept ✖ Cancel

</div>
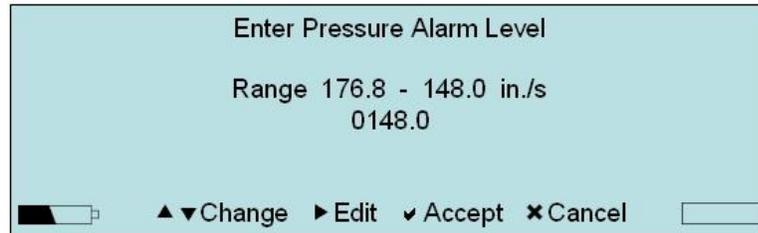
NOTE: If you are using a **Minimate Pro6** monitor with a geophone and a microphone attached, then there are options to edit the levels for both sensors.

(12)   Press the **Right Arrow** key to move the cursor within the value field, and the **Up** or **Down Arrow** key to **Change** the value setting.

(13)   Press the **Enter** key to **Accept** the new setting, or the **Cancel** key to exit the menu without saving the changes.

(14)   Within the **Edit Current Setup** menu, press the **Enter** key to **Save** the new **Auxiliary I/O** settings, or the **Cancel** key to exit the menu without saving the changes.

(15)   Press the **Enter** key two more times to **Save** the new settings as a **Setup File**.

9.4.9. Scaled Distance

Scaled Distance represents the division of distances by a scaling factor of the **Charge Weight** allowing the comparison between blasts of different sizes. The end function is to predict **Peak Particle Velocities** (**PPV**) when the energy released is a variable. Turn the **Scaled Distance** feature **On** to include the input and calculated **Scaled Distance** information with each **Event Summary Report.**

This information can then be used in conjunction with the software **Scale Distance Graph** tool which also invokes the **Max Weight Table** dialog tool that calculates a range of **Charge Weights** at different distances, based on a user-specified **PPV**. This provides a range of calculations enabling the user to obtain precise information for the blast site with a 95% confidence level. The **Scaled Distance** tool calculates the maximum **Charge Weight** per delay and the minimum safe structure distance for a specific blast site. The information is presented in a regression **Line Graph** represented by **Square Root**, **Cube Root**, or **Air Blast** calculations.

Enter the **Distance** from the blast and the **Charge Weight**. The **Distance** from blast factor is the measured distance from the blast charge to the monitor's sensors. The **Charge Weight** is the physical weight of the charge used per delay. The unit automatically calculates and displays the **Scaled Distance** value. The value will appear within the **Event Summary Reports** and can be used within the **Scaled Distance Graph** tool in the software, if the option is turned **On**.

```
Setup file:        Factory
Scaled Distance:         On [or Off]
Distance from Blast:     2.1 feet
Charge Weight:           3.1 lb
Scaled Distance:         2.6

████▉▷      ▲▼Adjust   ▶Edit   ✔Save   ✘Cancel      ██████
```

(1)   Press the **Up** or **Down Arrow** keys to highlight the **Scaled Distance** setting. It will be listed as being **On - Edit** or **Off - Edit**. Press the **Right Arrow** key to access the **Scaled Distance** menu.

(2)   Press the **Right Arrow** key to toggle the **Scaled Distance** option **On** or **Off**.

(3)   If you have decided to use the **Scaled Distance** feature, press the **Down Arrow** key to highlight the **Distance from Blast** option. Press the **Right Arrow** key to edit this field.

```
              Enter Distance from Blast

          Range  0.100 - 99999.0  feet
                  000006.8900


████▉▷      ▲▼Change   ▶Edit   ✔Accept   ✘Cancel      ██████
```

(4)   Press the **Right** and **Left Arrow** keys to navigate through the **Range** values.

(5)   Press the **Up** and/or **Down Arrow** keys to change the values within the **Enter Charge Weight** value menu.

(6)   Select **Enter** to **Accept** the specified value.

```
                Enter Charge Weight

          Range  0.100 - 99999.0  lb
                  000006.8510


████▉▷      ▲▼Change   ▶Edit   ✔Accept   ✘Cancel      ██████
```

(7)   Next, within the **Scaled Distance** menu, press the **Down Arrow** key until the **Charge Weight** option has been highlighted. Press the **Right Arrow** key to edit this field.

(8)   Press the **Right** and **Left Arrow** keys to navigate through the **Range** values.

(9)   Press the **Up** and/or **Down Arrow** keys to change the values within the **Enter Charge Weight** value menu.

(10)   Press the **Enter** key to **Accept** the specified value.

(11)   Press the **Enter** key to **Save** the changes and return to the **Edit Current Setup** menu.

9.4.10. GPS Location

Use the **GPS (Global Positioning System) Location** feature to enter location information of the sensor and unit, relative to the blast, and have it displayed in your Event Reports. GPS devices locate your exact longitude and latitude from orbiting satellites.

For accuracy and synchronization of several units, the unit time can also be set with the GPS device. This UTC (Coordinated Universal Time) time is created from the mean solar time at the Royal Observatory, Greenwich – refer to the **Date and Time** section under **View/Edit Preferences**, for more information on setting the time with a GPS device. To

use this feature of the unit, a NMEA 4800 standards compatible and supported GPS unit is required. Instantel has tested and recommends the Garmin® eTrex®.

(1)   Ensure that you have read the manufacturer's instructions that came with your GPS device unit prior to proceeding.

(2)   Collect the waypoint information for the **Vibration Source** and **Sensor(s)**.

(3)   Attach the GPS device to the connector on the unit labeled **Auxiliary** by using the supplied **RS-232** cable.

(4)   Press the **Setup** key.

(5)   Press the **Up** or **Down Arrow** keys on the unit to highlight **View/Edit Setup File** and then press **Enter**.

(6)   Press the **Up** or **Down Arrow** keys on the unit to highlight **GPS Location** and then press the **Right Arrow** key.

(7)   Within the **GPS Locations** menu, the unit prompts to **Select Way Point of the Vibration Source**. Select **Read GPS Location** by pressing the **Enter** key, or the **Cancel** key to return to the previous screen.
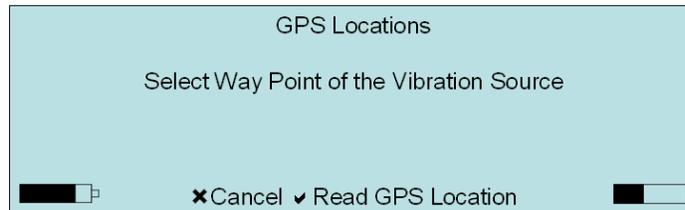
(8)   The unit briefly displays **Reading Location from GPS**.

(9)   The unit than prompts, **Select Way Point of [Sensor Name]**. Select **Read GPS Location** by pressing the **Enter** key, or the **Cancel** key to return to the previous screen. This step will be repeated if two sensors are attached to the unit.

(10)   After entering all GPS locations, the unit will display the results and request **Verify GPS Note**. An example screen is shown below, using one sensor:
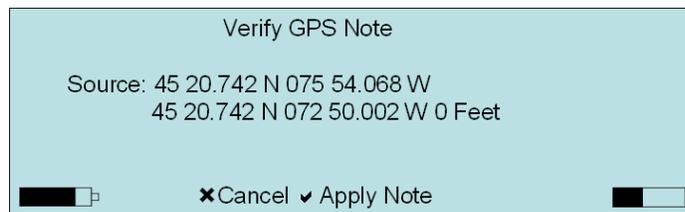
(11)   Press the **Enter** key to **Save** the file, or the **Cancel** key to return to the previous screen.

9.4.11. Location

Use this command to link a specific **Location** to the monitored Events. The information input into the **Location** will appear on the **Event Report** created in the software, under the **Notes** section, and displayed in the **Event Manager**. Select **Location** from the **Edit Current Setup** menu by pressing the **Right Arrow** key.
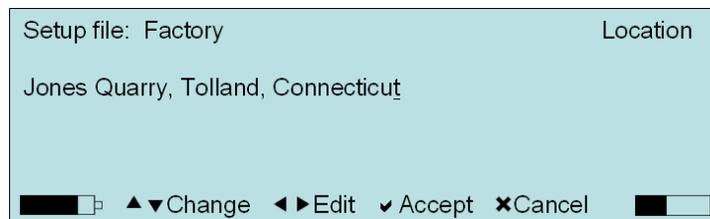
(1)   Press the **Up** or **Down Arrow** keys on the unit to highlight and **Change** the **Setup File**.

(2)   Press the **Right Arrow** key to select the file to **Edit**.

(3)   If you are editing the **Setup File**, then press the **Right** and **Left Arrow** key to move from each character field.

(4)   Press the **Up** or **Down Arrow** keys to change the character of each field. You are able to enter up to 40 characters.

(5)   Press the **Enter** key to **Save** the file, or the **Cancel** key to return to the previous screen.

9.4.12. Company

Use this command to link a specific **Company** to the monitored Events. The information input into the **Company** will appear on the **Event Report** created in the software, under the **Notes** section. Select **Company** from the **Edit Current Setup** menu by pressing the **Right Arrow** key.
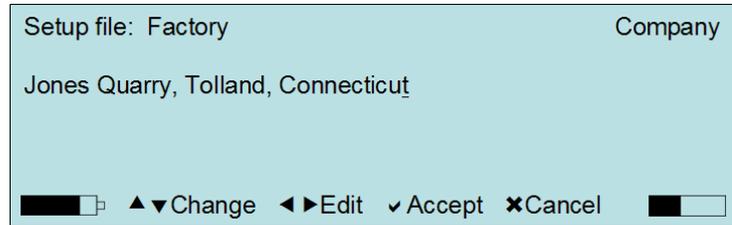
Setup file: Factory   Company

Jones Quarry, Tolland, Connecticut

▲▼Change ◀▶Edit ✔Accept ✖Cancel

(1)   Press the **Up** or **Down Arrow** keys on the unit to highlight and **Change** the **Setup File**.

(2)   Press the **Right Arrow** key to select the file to **Edit**.

(3)   If you are editing the **Setup File**, then press the **Right** and **Left Arrow** key to move from each character field.

(4)   Press the **Up** or **Down Arrow** keys to change the character of each field. You are able to enter up to 40 characters.

(5)   Press the **Enter** key to **Save** the file, or the **Cancel** key to return to the previous screen.

9.4.13. General Notes

The **General Notes** feature lets you include notes describing an Event. You can input the notes using the software and then copy them to the **Minimate Pro** or you can input the notes directly into the **General Notes** menu of the monitor. Use this menu to edit existing notes or add new notes. The information input into the **General Notes** will appear on the **Event Report** created in the software, under the **Notes** section.

Select **General Notes** from the **Edit Current Setup** menu.

General Notes

Add your information here by using the **Up** or **Down Arrows** to change the characters, or the **Right** and **Left Arrows** to change positions horizontally.

▲▼Change ▶Edit ✔Save ✖Cancel
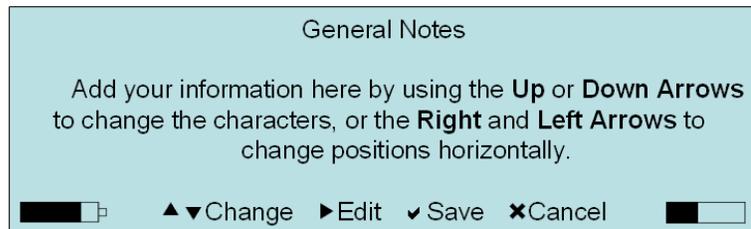
(1)   Press the **Up** or **Down Arrow** keys on the unit to highlight and **Edit** the **General Notes**.

(2)   If you are editing the **General Notes**, then press the **Right** and **Left Arrow** key to move from each character field.

(3)   Press the **Up** or **Down Arrow** keys to change the character of each field. You are able to enter up to 40 characters.

(4)   Press the **Enter** key to **Save**, or the **Cancel** key to return to the previous screen.

9.4.14. Job Number

You may include a **Job Number** for each recorded Event. Job numbers help you keep track of Events stored in the **Minimate Pro** or in the **Event Report**, under the **Notes** section. Job numbers range from 1 to 9999 and start with the initial number input in this menu.

Select **Job Number** from the **Edit Current Setup** menu.

```
Setup file:        Factory
Job Number Enable:    On
Job Number:           0001



■■■□▷     ▲▼Adjust   ▶Edit   ✔Save   ✖Cancel    ■■□□
```

(1)   Press the **Up** or **Down Arrow** keys on the unit to highlight **Job Number**.
(2)   Press the **Right Arrow** key to access the menu.
(3)   Press the **Right Arrow** key to toggle **Job Number Enable** to **On** or **Off**.
(4)   Press the **Down Arrow** key to highlight the **Job Number** selection.
(5)   Press the **Right Arrow** key to enter the value field.
(6)   Use the **Up** or **Down** arrow keys to edit the value field.
(7)   Press the **Enter** key to **Save** the file, or the **Cancel** key to return to the previous screen.

9.5. View/Edit Preferences

The View/Edit Preferences menu allows you to configure how the monitor communicates with the software, and how the interface is setup, such as the units used (imperial or metric), and display and sound options. These options are setup and saved, but not to a specific file. The monitor continues to operate with the current settings until the next change is made. This section outlines the procedures to change the preferences using the Minimate Pro keyboard. For information on how to change the preferences using THOR or Blastware, refer to the THOR or Blastware Operator Manual.

1.   Select the Setup key on the unit to access the main setup selection menu. Use Down Arrow key and highlight the View/Edit Preferences menu item. Press the Enter key to select View/Edit Preferences.

```
10/15/2008   12:24:05 PM                          Factory
                      R┌─────────────────────┐tor
                       │ Select Setup File    │
                       │ Select Operator      │
Vibration:   ISEE Tri  │ View/Edit Setup File │
Pressure:    ISEE Lin  │ View/Edit Preferences│ 2
                       │ Maintenance Menu     │
■■■□▷                  └──▼View Data Files────┘      ■■□□
```
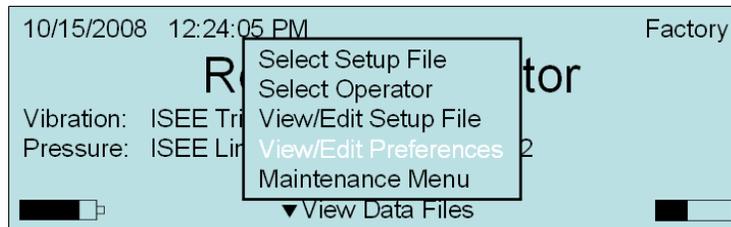
2.   Press the Up or Down Arrow keys on the unit to highlight Next/Prev Setup options. Press the Right Arrow key to select a Preferences option for toggling, editing or viewing. Press the Enter key to Save any changes, or the Cancel key to return to the previous screen. The image below indicates in "*[…]*" the result of a Right Arrow key selection:

```
                           Preferences
Sensor Check:            Disabled [Before Event, After Event]
Measurement System:      Metric [Imperial]
Pressure Units:          Pa [dB] [psi or dB if Imperial is set]
Display and Sound:       Edit
Ethernet:                On/Automatic
Auto Call Home:          Edit
Date and Time:           Edit
Password Protection:     Off [On ]
GPS Event Synchronization: Off [On ]
Reset to Factory Defaults: Now [Right Arrow key resets defaults]
        ▲▼Next/Prev  ►Edit  ✓Save  ✗Cancel
```
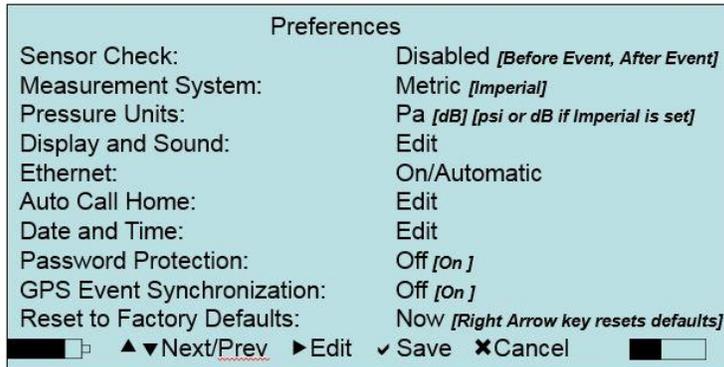
9.5.1. Sensor Check

Use the **Sensor Check** feature to determine if the attached sensors are connected, oriented, and working properly, or to ensure that the sensors match the current settings within the **View/Edit Setup File** menu if it has been set to **Before** or **After** an Event. The results of the Sensor Check and the associated information for each sensor, including **Serial Number**, **Calibration Date**, and **Calibration Location**, appear on the Event Report.

A Sensor Check may be setup to occur automatically, or by manual key-press:

(1)   Repeatedly press the **Right Arrow** key to set when a Sensor Check will occur, After Event or Before Event. You can also select **Disable**. If you select Disable, a Sensor Check can still be performed manually by pressing the **Sensor Check** key on the monitor. The manual Sensor Check is only allowed when the unit is not in monitor mode.

        If Sensor Check is set **Before Event**, the check is performed once and added to all subsequent Event data. If the Sensor Check is set to **After Event**, then the Sensor Check is performed after each Event and added to each Events data.

(2)   Press Enter key to Save any changes, or the Cancel key to return to the Preferences menu, or

(3)   Press the Sensor Check key to perform a manual check while at the main menu.

NOTE: The Sensor Check is not a calibration check and cannot replace the annual calibration process. Sensor Check does not compare the measured result against an external traceable reference sensor, nor does it test the entire electronic circuit that is integral to the sensor's response.

NOTE: The sensors selected within the Edit Current Setup menu should match what is attached to the unit.

        Example: If the Pressure Sensor Channel is Off and a Linear Microphone is attached, or if it is On, and a Linear Microphone is not attached, the Sensor Check will return the message, "*Sensor Detection Error – Attached Sensors do not match setup*".

When a Sensor Check error occurs, check the following for possible causes:

- o Was the sensor moved during the Sensor Check? This will result in a failed reading.
- o Ensure that the orientation of the Geophone is correct, as per the given application, such as a ceiling installation. Refer to the section in this manual, *Geophone Direct Hard Surface Mount Installation Instruction.*
- o Check all cable connections.
- o Check cables and connectors for wear, bent pins, or foreign debris.
- o If required, return the sensor to an Authorized Instantel Representative for further testing.

Example 1:

An example of a Sensor Check set to Before Monitoring on a Minimate Pro6 that did not pass is shown below:

```
10/15/2008    1:24:05 PM                          Factory

                  Sensor Check


  ■■□                                          ■□
```
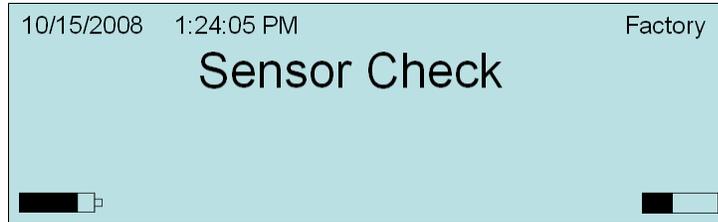
The next screen displays the Setup and Detected Sensor Mismatch message when trying to record using sensors that do not match the Setup File. Note that the Vibration 1 channel displays No Sensor In Setup, but the message below it states that and ISEE Triaxial Geophone has been Detected.

```
Setup and Detected Sensor Mismatch

Vibration 1:  No Sensor                      In Setup
              ISEE Triaxial Geophone         Detected
Vibration 2:  ISEE Triaxial Geophone         In Setup
              ISEE Linear Microphone         Attached
  ■■□      ✖ Cancel  ✔ Accept Attached Sensors    ■□
```

Press the Enter key to Accept the setup as shown and proceed to monitor, or press the Cancel key to exit and edit the Setup file.

```
              Sensor Detection Error


        Attached Sensors do not match setup



                    ✔ Continue
```
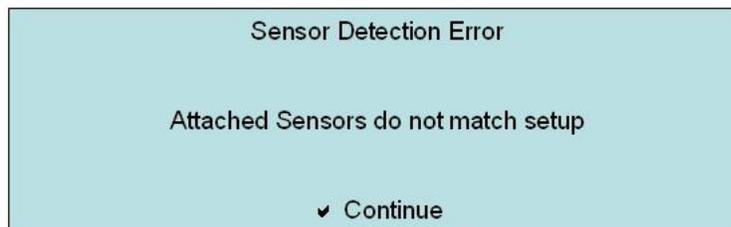
Example 2:

Even though you have accepted to ignore the Setup and Sensor Mismatch warning, an additional screen is displayed indicating that there is an additional error with the orientation of the Geophone; the Vert (Vertical) channel states "*Check*" indicating that the sensor has been incorrectly positioned upside down or is not working properly:

```
Tran  Pass   Freq = 7.4Hz        Over Swing 3.9
Vert  Check  Freq = 0.1Hz        Over Swing 7.9
Long  Pass   Freq = 7.4Hz        Over Swing 3.7
MicL  Pass   Freq = 20.4Hz       Amp=16747 mv



  ■□                ✔ Continue              □
```
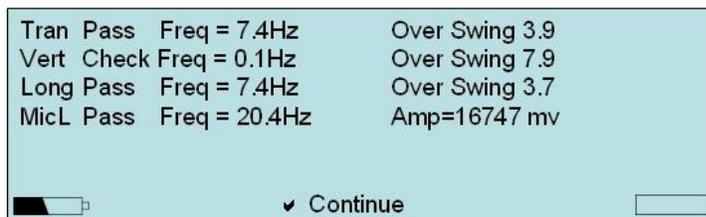
(1)1. ***Sensor Check Overview – Geophones***

Sensor Check measures a geophone's natural frequency and damping indicated by an **Overswing Ratio (OR)**. Sensor Check sends an electric pulse to the geophones and measures the response. If the geophone's response falls within a specified range, the monitoring operations can continue. If the geophone's response does not fall within a specified calibration range, the geophone is not setup or functioning properly. You cannot record Events until you fix or replace the geophones.

Natural Frequency

Waveform measurements check the natural frequency (or period [t]) of a geophone's sensor coil assembly. Referring to the figure below, the distance from P_1 to P_2 represents 0.125 seconds. Since Frequency is the reciprocal of the period, F=1/t, the frequency is approximately 8 Hz. A calibrated sensor has a natural frequency between 6.5 and 9.5 Hertz. Calculations for all geophones appear with each recorded Event.

Calculating the Natural Frequency of a Geophone
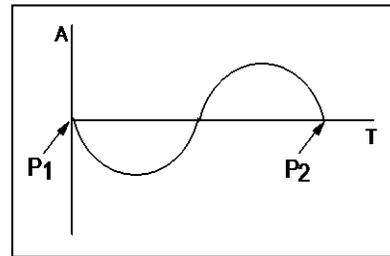
Damping – Overswing Ratio (OR)
The OR measures damping and is calculated by computing the ratio of the magnitude of adjacent waveform peaks according to the following formula:

$$OR = \frac{A_1}{A_2}$$

Acceptable OR ranges from 2.8 to 4.8. The figure below displays a graph of a geophone coil's "free fall" response. A_1 and A_2 are used for OR calculations.

Calculating the Overswing Ratio of a Geophone
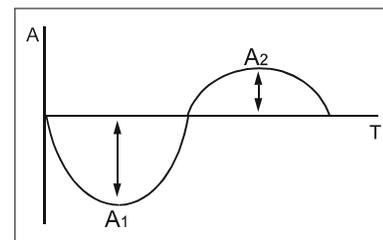
(1)2. ***Sensor Check Overview – Microphones***

Sensor Check tests the microphone operation by sending a signal to the microphone and measuring its frequency and amplitude response. If the results of the test fall within specified ranges, the microphone is within calibration.

9.5.2. Measurement System

The unit uses the Metric or the Imperial measurement system. Event Reports and displayed results will be shown in the selected units. To set the unit to operate with either system, follow the directions below.

(1)   Press the Right Arrow key to set the Measurement System to Metric or Imperial. All system responses and Event Reports involving measurement values will be displayed in the selected Measurement System.

(2)   Press Enter key to Save any changes, or the Cancel key to return to the Preferences menu.

9.5.3. Pressure Units

Determine the Pressure Units that you would like to display on the monitor and Event Reports for the Linear Microphone Pressure Channel. The options are Pa, psi, or dB, and the availability of these is dependent on the setting you have selected for the Measurement System, Imperial or Metric. Pa is not available when the Measurement System is set to Imperial.

(1)   To set the Pressure Unit, press the Right Arrow key to access the unit field.

(2)   Press the Up or Down Arrow keys to change the unit value, which is dependent on the selected Measurement System.

(3)   Press Enter key to Save any changes, or the Cancel key to return to the Preferences menu.

9.5.4. Display and Sound

Use the options within the Display and Sound menu to determine how the unit reacts to your key entries. You can also control the amount of battery consumption by reducing the time the LCD backlight is on.

From the main menu, press the **Setup > View/Edit Preferences > Display and Sound** to access the following features:

(1)   **Beep on Trigger:**

Turn this feature **On** and the monitor will emit a beeping sound each time it is triggered to record an Event.

1. Ensure that **Beep On Trigger** is highlighted.
2. To set the unit to beep **On** or **Off**, press the **Right Arrow** key to toggle between the two options.
3. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **View/Edit Preferences** menu.

(2)   **Beep on Key Press:**

With this feature **On** the monitor will emit a beeping sound at each key press.

1. Use the **Down Arrow** key to highlight **Beep on Key Press**.
2. To set the unit to beep **On** or **Off**, press the **Right Arrow** key to toggle between the two options.
3. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **View/Edit Preferences** menu.

(3)   **Backlight:**

Use this feature to either help conserve power, by turning it **Off**, or turn it **On** to provide a better view of the information in low-light conditions.

1. Use the **Down Arrow** key to highlight **Backlight**.
2. To set the unit **Backlight** option, press the **Right Arrow** key to edit the time value.
3. Press the **Right** or **Left Arrow** keys to move between value fields.

4. Press the **Up** or **Down Arrow** keys to edit each field.
5. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **View/Edit Preferences** menu.

(4) **Backlight Timeout:**

For battery conservation, the unit **Backlight Timeout** feature can be used to set the backlight to turn off after a designated amount of time.

1. Use the **Down Arrow** key to highlight **Backlight Timeout**.
2. To set the time value for the **Backlight Timeout**, press the **Right Arrow** key to access the value fields.
3. Press the **Right** or **Left Arrow** keys to navigate within value field.
4. Press the **Up** or **Down Arrow** keys to change the value. The maximum setting is 999.
5. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **View/Edit Preferences** menu.

(5) **Display Auto Off:**

For battery conservation, the **Display Auto Off** feature must be set to **Enabled** to ensure that the LCD display will turn off after 2 minutes of no entries on the unit. If it is **Disabled**, the LCD display will remain on.

1. Use the **Down Arrow** key to highlight **Display Auto Off**.
2. Press the **Right Arrow** key to access this feature.
3. Press the **Right Arrow** key to change between **Enabled** and **Disabled**.
4. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **View/Edit Preferences** menu.

(6) **Display Color Levels:**

Using three primary colors **Red**, **Green** and **Blue** (**RGB**), you can alter the color of the display backlight by balancing the amount of each color value. The maximum range of each color is 15. Experiment with each color value to determine which color is most suitable.

1. Use the **Down Arrow** key to highlight **Display Color Levels**.
2. Press the **Right Arrow** key to access this feature.
3. Press the **Up** or **Down Arrow** key to select which color you want to edit.
4. Press the **Right Arrow** key to edit the first value, and again to edit the second value.
5. Press the **Up** or **Down Arrow** keys to edit the values.
6. Press **Enter** to **Save** the changes.
7. Press **Enter** to return to the **Display and Sound** menu, or **Cancel** to return to the menu without saving the changes.

(7) **Display Contrast Level:**

Using three primary colors **Red**, **Green** and **Blue** (**RGB**), you can alter the color of the display backlight by balancing the amount of each color value. The maximum range of each color is 15. Experiment to determine which color is most suitable for the current lighting situation.

1. Use the **Down Arrow** key to highlight **Display Contrast Levels**.
2. Press the **Right Arrow** key to access this feature.
3. Press the **Up** or **Down Arrow** key to change the value. The smaller the number, the lighter the display. The allowable contrast range is from 12 to 40.
4. Press **Enter** to **Save** the changes.
5. Press **Enter** to return to the **Display and Sound** menu, or **Cancel** to return to the menu without saving the changes.

9.5.5. Ethernet

Ethernet® is a high-speed network communication protocol standard that is primarily used for Local Area Networks (LAN) to connect end-systems, in this instance, the **Series IV** units to a network. The **Series IV** units have the ability to communicate using an **Ethernet** connection with the **Ethernet Communication Cable**, **Minimate Pro to PC** (Part No. 720A4101). One cable for each unit is required when setting up multiple units on a router.

```
                    Ethernet Configuration
Ethernet:                    Enabled
Mode:                        Static
Static IP Address:           000.000.000.000 [Edit]
Network Mask:                000.000.000.000 [Edit]
Gateway:                     000.000.000.000 [Edit]
DNS Server IP:               000.000.000.000 [Edit]
Reset:                       Now

   ■■■□       ▲▼Next/Prev   ▶Edit  ✓Save  ✗Cancel    ■■□
```

This communication includes downloading recorded **Event**s and uploading setup files to the unit at a much faster rate than serial or USB, and with **THOR** or the optional **Blastware Advanced Module**, the ability to view **Histogram** data in real-time.

Refer to the **THOR** or **Blastware Operator Manual** for additional information about setting up the **Ethernet** communications feature, and the common terminology used, below:

LAN – Local Area Network	A LAN is a communications system that links computers and/or devices (Printers, Monitors, Servers, etc.) within a confined geographic area, such as a home or office building.
WAN – Wide Area Network	A WAN is a communications system that links computers and/or devices within a larger network, such as between cities or different building locations.
TCP/IP – Transmission Control Protocol/Internet Protocol	TCP/IP is the backbone communication language of the internet or intranet.
DNS – Domain Name Server	DNS hosts domain names and acts as the 'phone book' for the Internet by creating IP Addresses from domain names. DNS routes all queries for your domain to your server.
IP Address – Internet Protocol	The IP Address is a unique address assigned for devices to communicate with one another over a computer network.
DHCP - Dynamic Host Configuration Protocol	DHCP is where a device (such as your PC) on a local network, known as a DHCP Server, assigns temporary addresses to attached devices.
DHCP/Auto IP Address	If the program is not able to create a DHCP address, then Auto IP is used.
Automatic IP Address	The Auto IP Address is a communications protocol that allows devices at either end of a network segment to advertise and negotiate operation (e.g. link speed, data flow control), by assigning an IP Address. This is done by ensuring that the TCP/IP protocol is installed and set to obtain the IP Address automatically from the DHCP server.
Static IP Address	A set (non-dynamic) IP address. If you have a Static IP Address, it is recorded in the DNS (Domain Name Server), which are servers

	located throughout the Internet that handle the routing of Internet and email. A Static IP Address remains unchanged, even when rebooting your PC or Router. Obtain your Static IP from a local Internet Service Provider.
Static IP Mask	Static IP Masks are used to separate IP networks into subgroups. Obtain your Static IP Mask from a local Internet Service Provider.
Router	A Router is a device that acts as a gateway, controlling messaging for communication and access to network resources, between a LAN and a WAN.

(1)   **Ethernet:**

Turn this feature **On** or **Off** by following the directions below:

1. Press the **Up** or **Down Arrow** key to highlight **Ethernet**.
2. Press the **Right Arrow** key to access the **Ethernet** menu.
3. Press the **Right Arrow** key to toggle between **On** and **Off**.
4. Press the **Enter** key to save this setting.

(2)   **Mode:**

There are two IP Address modes to choose from to establish communications, a) Automatic IP and b) Static IP. With the Automatic IP setting, the DHCP server will assign the address to your Minimate Pro. If you choose the Automatic IP setting, the IP Address, Network Mask, Gateway, and DNS Server IP fields are automatically obtained from the DHCP server. Instantel recommends that you use the Automatic setting if the unit has access to a DHCP server.

For Static IP, you must purchase an IP Address from an Internet Service Provider, which usually involves a nominal monthly payment, and then enter the number into the Static IP Address section.

1. Press the **Down Arrow** key to highlight **Mode**.
2. Press the **Right Arrow** key to toggle between **Automatic** or **Static IP**. Select the **Mode** of communication you want to use.
3. Press the **Enter** key to save this selection.

(3)   **Static IP Address:**

After you have purchased a **Static IP** from an Internet Service Provider, enter the number in the **Static IP Address** field. The first 3 sets of numbers, divided by periods (Example: **192**.**196**.**001**.001), of the **Static IP** must match and be input into the PC TCP/IP network setting for the Ethernet hardware, with the last number altered (Example: 192.168.001.**002**). The **Static IP** address *must match exactly* within the **THOR** or **Blastware Communications** dialog. Refer to the software Operator Manual for more detailed information on setting up the **Static IP**.

1. Press the **Down Arrow** key to highlight **Static IP Address**.
2. Press the **Right Arrow** key to enter the editing mode.
3. Press the **Right** and **Left Arrow** keys, as required, to place the cursor under the desired numeral.
4. Press the **Up** or **Down Arrow** keys to edit each field.
5. Press the **Enter** key to save the new setting.

(4)   **Network IP Mask:**

After you have purchased a **Static IP** from an Internet Service Provider, enter the supplied **Network Mask** number into the field, if applicable. LANs typically use the 255.255.255.0 **Network Mask**.

1. Press the **Down Arrow** key to highlight **Network IP Mask**.
2. Press the **Right Arrow** key to enter the editing mode.
3. Press the **Right** and **Left Arrow** keys, as required, to place the cursor under the desired numeral.
4. Press the **Up** or **Down Arrow** keys to edit each field.
5. Press the **Enter** key to save the new setting.

(5)   **Gateway:**

After you have purchased a **Static IP** from an Internet Service Provider, enter the Gateway number into the field, if applicable.

1. Press the **Down Arrow** key to highlight **Gateway**.
2. Press the **Right Arrow** key to enter the editing mode.
3. Press the **Right** and **Left Arrow** keys, as required, to place the cursor under the desired numeral.
4. Press the **Up** or **Down Arrow** keys to edit each field.
5. Press the **Enter** key to save the new setting.

(6)   **DNS Server IP:**

After you have purchased a **Static IP** from an Internet Service Provider, enter the DNS Server IP into the field, if applicable.

1. Press the **Down Arrow** key to highlight **Gateway**.
2. Press the **Right Arrow** key to enter the editing mode.
3. Press the **Right** and **Left Arrow** keys, as required, to place the cursor under the desired numeral.
4. Press the **Up** or **Down Arrow** keys to edit each field.
5. Press the **Enter** key to save the new setting.

(7)   **Reset:**

Use the **Reset** command to return all **Ethernet** settings to the factory default. This command also assigns a new **Auto IP Address** to the unit.

1. Press the **Down Arrow** key to highlight **Reset**.
2. Press the **Right Arrow** key to activate the **Reset** command.
   After Reset, the Ethernet connection is disabled.

9.5.6. Auto Call Home

Combined with the Auto Call Home feature of THOR or Blastware, your monitor can be setup to automatically download results after an event. You can set up Auto Call Home on your unit or you can set it up within THOR or Blastware on your PC. Please refer to the software Operator Manual for information on how to successfully configure Auto Call Home and setup modems for use with the monitor.

```
                    Auto Call Home
Auto Call Home:              Enabled
Interface:                   Serial
Serial Baud Rate:            115200
Session Timeout:             30 Min

 ▬▬▭     ▲▼Next/Prev   ▶Edit  ✓Save  ✗Cancel     ▬▬
```

To turn Auto Call Home on:
1. Use the **Up** or **Down** arrow to highlight the **Auto Call Home** menu item.
2. Press the **Right Arrow** key to select **Enabled**.
3. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **Preferences** menu.
4. The status of **Auto Call Home** can be viewed in the upper right corner of the main menu while monitoring which will indicate **Connecting**, **Transfer Data**, or **Retry**.
   To Cancel a call home that is in progress, press the **Cancel** key only once – two key presses will also end the monitoring session.

To turn Auto Call Home off:
1. Use the **Up** or **Down** arrow to highlight the **Auto Call Home** menu item.
2. Press the **Right Arrow** key to select **Disabled**.
3. Press **Enter** key to **Save** any changes, or the **Cancel** key.

(1)   **Interface**

Use the **Interface** menu option to select **Serial** or **Ethernet** to choose the type of interface cable you would like to use for Auto Call Home. If you choose serial, use an RS-232 Communication Cable. If you choose Ethernet, choose an Ethernet Communication cable.

To select the Interface for Auto Call Home:
1. Use the **Up** or **Down** arrow to highlight the **Interface** menu item.
2. Press the **Right Arrow** key until you have selected **Serial** or **Ethernet**.
3. Press **Enter** key to **Save** any changes, or the **Cancel** key to return to the **Preferences** menu.

(2)   **Serial Baud Rate**

The **Serial Baud Rate** refers to the rate at which both the PC and the monitor will communicate. The baud rate of the unit and the software must be the same for a successful communication link.

To select the Serial Baud Rate:
1. Press the **Right Arrow** key to access the **Serial Baud Rate** field.
2. Continue to press the **Right Arrow** key to cycle through the communication speed options of **115200**, **38400**, or **9600** – ensure that it matches with the software setting, or you will not be able to communicate with the unit using your PC. The lower the number, the slower the rate of communications and file transfer.
3. Press **Enter** key to **Save** any changes.

(3)   **Call Home Session Timeout**

Use the **Call Home Session Timeout** to automatically terminate after a defined amount of time (1−999 minutes). The time starts as soon as the PC is successfully connected to the remote unit. If an Auto Call Home connection is terminated because of this timeout a "Session timeout" entry is made in the CALLHOME.LOG.

1. Press the **Down Arrow** key to highlight **Session Timeout**.
2. Press the **Right Arrow** key to enter the editing mode.
3. Press the **Right** and **Left Arrow** keys, as required, to place the cursor under the desired value.
4. Press the **Up** or **Down Arrow** keys to edit each field.
5. Press the **Enter** key to save the new setting.

NOTE: Make sure that the timeout is long enough to allow an event to download before the connection is terminated. For example, a 1-second, 4-channel event recorded at 1024

sps takes about 1 minute to transfer using a typical modem connection.

(4) Call Home Access Type

The **Call Home Access Type** is a toggle field that you can select to choose either an **IP Address** or **DNS Name** for Auto Call Home. If you select **IP Address**, use the **Server IP Address** field to edit the Call Home Server IP address. If you select DNS Name, use the **Call Home DNS Name** to enter the Internet registered name of the Call Home Server.

1. Press the **Right Arrow** key to access the **Call Home Access Type** field.
2. Press the **Right Arrow** key to toggle between **IP Address** and **DNS Name**.
3. If you selected **IP Address**, enter the IP address in the **Server IP Address** field.
4. If you selected **DNS Name**, enter the DNS name in the **Call Home DNS Name** field. A new menu appears in which you can enter the Internet registered name.
5. Press **Enter** key to **Save** any changes.

(5) Ethernet Protocol

If you selected **Ethernet** as the Interface type for Auto Call Home, choose **TCP** or **UDP** for the Ethernet Protocol and select the Server Port number that you would like to use. We recommend that you choose TCP for field deployment and UDP for laboratory or controlled environments.

NOTE: When you are using Ethernet, ACH transfer is faster when you are connected directly through the Internet rather than through a modem.

1. Press the **Down Arrow** key to access the **Ethernet Protocol** field.
2. Press the **Right Arrow** key to toggle between **TCP** and **UDP** protocols.
3. Press the **Down Arrow** key to access the **Server Port** field.
4. Edit the **Call Home Server IP port number**. Press **Enter** key to Save changes.

9.5.7. Date and Time

There are several ways to set the unit **Date and Time**. You can enter the Date and Time directly on the unit within the View/Edit Preferences menu, you can attach the unit to the PC and use the THOR or Blastware software to send a set Date/Time or synchronize with the PC's date and time. The clock on the unit *does not* automatically adjust for Daylight Savings – ensure that you update the clock on these dates so that the correct time is displayed on the Event Reports.

Follow the directions below to set the time and date by using unit menu:
Access the **Date and Time** command to set the unit time, using a **12** or **24-hour** format, manually or from an attached GPS device. The time may also be sent from THOR or Blastware to synchronize with the PC setting. Refer to the THOR or Blastware Operator Manual for more information about synchronizing the time.

There are three **Date Formats** available: **mm-dd-yy** (Month–Day–Year), **dd-mm-yy** (Day–Month–Year), or **yy-mm-dd** (Year–Month–Day). The date format will appear on all subsequent data, including Event Reports.

From the main menu, press the **Setup** key **> View/Edit Preferences > Date and Time**.

```
                          Date and Time
Current Time:                     Edit [New Menu]
Set UTC Time from GPS             Read GPS [Confirmation Menu]
UTC Offset:                       +00 hr  00 min
Time Format:                      24-hour [12-hour (AM/PM)]
Date Format:                      dd-mm-yy [mm-dd-yy or yy-mm-dd]
  ▮▮▮▯  ▲▼ Next/Prev  ▶ Edit  ✔ Save  ✗ Cancel   ▮▮▯▯
```

(1)   **Current Time:**

1. To set the **Current Time**, press the **Setup** key and press the **Down Arrow** key until **View/Edit Preferences** is highlighted.
2. Press the **Enter** key.
3. Press the **Down Arrow** key until **Date and Time** is highlighted, then press the **Right Arrow** key to access the menu.
4. **Current Time** is the first item within the **Date and Time** menu. Press the **Right Arrow** key to access the menu and change the current time manually. The following menu appears:

```
                        Edit Current Time
Year:                          2008
Month:                         10
Day:                           25
Hour:                          14
Minute:                        52
■■■▶    ▲▼Next/Prev   ▶Move  ✔Save  ✖Cancel      ■    ▶
```

5. Use the **Down Arrow** to highlight the item you want to change, and then press the **Right Arrow** enter the editing mode.
6. Press the **Right** or **Left Arrow** to move to the next value entry.
7. Press the **Up** or **Down Arrow** to change the value of each field.
8. Press the **Enter** key to **Save** the changes, or the **Cancel** key to exit without saving any changes made.

(2)   **Set UTC Time from GPS:**

For accuracy and synchronization of several units, the unit time can also be set with a GPS device. This **UTC** (Coordinated Universal Time) time is created from the mean solar time at the Royal Observatory, Greenwich. If you are using a GPS device to set the time, you will also need to set the **UTC Offset**, refer to part **(3)**.

1. To set the time with a GPS device, press the **Down Arrow** key until **Set UTC Time from GPS** is highlighted. Press the **Right Arrow** key to **Read**.
2. A **Current Time from GPS** confirmation menu appears, requesting that you ensure a NMEA 4800 compliant interface is selected:

```
                    Current Time from GPS

            Ensure a GPS is attached to the Auxiliary Port
                 and its interface is set to NMEA 4800


  ■■■▶          ✖Cancel    ✔Read from GPS          ■    ▶
```

3. Press the **Enter** key to Read from GPS, and the unit responds with a brief message, "Setting Time from GPS. Please Wait…"
4. The **UTC Offset** menu appears and is used to adjust the UTC GPS time zone to your location. If you are unsure of the time zone in relation to UTC, please refer to the link below:

    http://tycho.usno.navy.mil/tzones.html

5. Press the **Right Arrow** key to access the edit value fields.
6. Press the **Up** or **Down Arrow** keys to adjust the + or −, **hr**, and **min**.
7. Press the **Enter** key to **Save**, or the **Cancel** key to return to the previous menu.

8. Press the **Cancel** key to return to the previous menu.

(3)   **Time Format:**

1. To set the **Time Format** to either **24-hour** or **12-hour**, press the **Setup** key and press the **Down Arrow** key until **View/Edit Preferences** is highlighted.
2. Press the **Enter** key.
3. Press the **Down Arrow** key until **Date and Time** is highlighted, then press the **Right Arrow** key to access the menu.
4. Press the **Down Arrow** key until **Time Format** is highlighted within the **Date and Time** menu. Press the **Right Arrow** key to edit and toggle between **24-hour** and **12-hour**.
5. Press the **Enter** key to **Save** the new **Time Format**.

(4)   **Date Format:**

1. To set the **Date Format** to **yy-mm-dd**, **mm-dd-yy**, or **dd-mm-yy**, press the **Setup** key and press the **Down Arrow** key until **View/Edit Preferences** is highlighted.
2. Press the **Enter** key.
3. Press the **Down Arrow** key until **Date and Time** is highlighted, then press the **Right Arrow** key to access the menu.
4. Press the **Down Arrow** key until **Date Format** is highlighted within the **Date and Time** menu. Press the **Right Arrow** key to edit and toggle between **yy-mm-dd**, **mm-dd-yy**, or **dd-mm-yy**.
5. Press the **Enter** key to **Save** the new Date Format.

9.5.8. Password Protection

This feature activates a password control requiring an operator to enter a password before being able to exit a monitor mode. The password prevents an unauthorized exit from monitor mode while still allowing an operator to view **Event** summaries. Password control can be turned on or off. The operator doesn't need to know the password to change it or to turn it **On/Off**: However, they do need to know the password to stop a monitoring session if the feature is turned **On**.

```
                      Password Protection
Password Protection:            Off
Enter New Password:             ****



       ▄▄▄▄▖     ▲ ▼ Next/Prev   ▶ Edit   ✔ Save   ✖ Cancel      ▄▄
```

(1)   Use the **Down Arrow** key to highlight **Password Protection**.

(2)   Press the **Right Arrow** key to access this feature.

(3)   **Highlight Password Protection** and use the **Right Arrow** to turn it **On**.

(4)   Press the **Down Arrow** key to highlight **Enter New Password**.

(5)   Press the **Right Arrow** key to edit the password.

(6)   Press any sequence of 4 keys to set a password that will prevent an interruption in recording. When the fourth key press is entered, the password is set. Any key may be used with the exception of **On/Off** and **Cancel**.

9.5.9. GPS Event Synchronization (Optional)

This optional internal GPS module in the Minimate Pro allows you to synchronize the time between two or more units using the GPS time. The accuracy of this time difference is dependent on the sample rate configured.

Before you can setup GPS Event Synchronization on your unit, you need to have the following:

o   Factory installed GPS modification on the Minimate Pro unit
o   GPS antenna
o   THOR (Blastware does not support GPS)
o   Minimate Pro firmware, version 10.74 or higher

The following table shows how the accuracy of the time between two or more units changes when GPS Event Synchronization is enabled, depending on the sample rate configured. Note that the effective sample rate reflects the real sample rate running when the GPS Event Synchronization feature is enabled, due to the extra processing time required by the GPS feature. The timing between the units does not apply when the GPS Event Synchronization feature is disabled.

Configured Sample Rate	Effective Sample Rate (GPS Event Synchronization is On)	Timing Between Units (In Ideal Conditions)
64 Ksps	48 Ksps	Less than or equal to 100 μs
32 Ksps	24 Ksps	Less than or equal to 100 μs
16 Ksps	12 Ksps	Greater than 100 μs, but less than or equal to 200 μs
8 Ksps	8 Ksps	Greater than 200 μs, but less than or equal to 300 μs
4 Ksps	4 Ksps	Greater than 300 μs, but less than or equal to 400 μs
2 Ksps	2 Ksps	Greater than 400 μs, but less than or equal to 1000 μs
1 Ksps	1 Ksps	Greater than 1000 μs

Note: Due to differences in ground materials and the placement of geophones, the timing between the units may vary.

When GPS Event Synchronization is enabled and locked to a GPS, the word GPS appears beside the time on the unit display. Note that this can take a few minutes to initialize when first enabled. The word GPS does not appear on the display when GPS Event Synchronization is disabled.
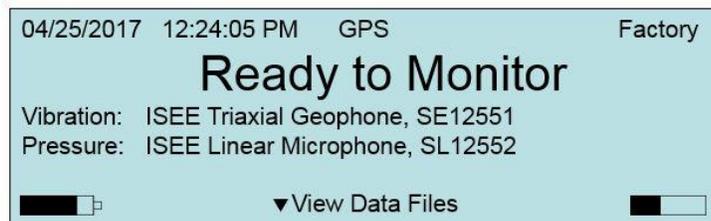
When GPS Event Synchronization is enabled and locked, if the unit loses its lock to the GPS for any reason (e.g., poor signal or a broken antenna), the word GPS on the screen disappears 6 minutes after losing its lock. This is because the time remains accurate for up to 6 minutes after the lock is lost. If the unit is in idle mode, the GPS lock status is updated every 30 seconds. If the unit is in monitoring mode but not in the process of recording an event, the GPS lock status is updated whenever the lock status changes. The lock status is also updated after a waveform recording is completed.

When you are editing the time manually on a Minimate Pro unit, and GPS Event Synchronization is enabled and locked to GPS, the time you enter will be saved and adjusted to your local time. When there is a GPS lock, the minutes and seconds of the unit time are updated to GPS time, but not the hour. When there is no GPS lock, the unit time is updated to the time entered by the user.

The following screen shot shows what the event list time stamp looks like with GPS Event Synchronization enabled. Note that the timestamp is accurate to the microsecond.

Date	Time	Setup	1 of 5
⚡ 01/06/2017	13:39:47:910:279	setup file_Test	
⚡ 01/06/2017	13:39:54:620:932	setup file_Test	
⚡ 01/06/2017	13:40:02:198:713	setup file_Test	
⚡ 01/06/2017	13:40:09:354:677	setup file_Test	
⚡ 01/06/2017	13:40:24:431:598	setup file_Test	

▲▼Next/Prev   ►Detail   ✔Menu   ✖Back

The following screen shot shows what the event list time stamp looks like with GPS Event Synchronization disabled. Note that when GPS Event Synchronization is disabled, the timestamp is accurate to the second.

Date	Time	Setup	1 of 5
⚡ 01/06/2017	13:46:45	setup file	
⚡ 01/06/2017	13:46:54	setup file	
⚡ 01/06/2017	13:47:04	setup file	
⚡ 01/06/2017	13:47:14	setup file	
⚡ 01/06/2017	13:47:24	setup file	

▲▼Next/Prev   ►Detail   ✔Menu   ✖Back

To enable the GPS Event Synchronization feature:

The following screen shot and procedure show you how to enable the GPS Event Synchronization feature, available from the Preferences menu.

10/15/2017 10:59:00   GPS   GPS Event Synchronization

GPS Event Synchronization: On
Leap Second: 18

▲▼Next/Prev   ►Edit   ✔Save   ✖Cancel

(1)   From the Preferences menu, use the **Down Arrow** key to highlight **GPS Event Synchronization**.

(2)   Press the **Right Arrow** key to access this feature.

(3)   Highlight **GPS Event Synchronization** and use the **Right Arrow** to turn it **On**.

(4)   Follow steps 4 and 5 only if you need to change the default Leap Second number.
Press the **Down Arrow** key to highlight **Leap Second**.

(5)   Press the **Right Arrow** key to edit the value. The current default is 18 seconds. Note: The UTC leap second number is set periodically by the International Earth Rotation Service. The current default number of 18 is the number of seconds by which GPS time is ahead of UTC time (GPS time is not adjusted for leap seconds). You do not need to change this default number until the next leap second decision takes place. For more information about when this decision is made, see https://www.iers.org/SharedDocs/News/EN/BulletinC.html.

(6)   Press the **Enter** key to **Save** the changes.

9.5.10. Reset to Factory Defaults

A default setup file has been provided with the Minimate Pro, which reverts the setup and preferences to the original configuration at time of shipment. This will not delete setup files or saved information.

(1)   From the main display, press the **Setup** key.

(2)   Press the **Down Arrow** key until **View/Edit Preferences** is highlighted, and press the **Right Arrow** key to access the menu.

(3)   Press the **Down Arrow** key until **Reset Factory Defaults** is highlighted.

(4)   Press the **Right Arrow** key to reset the factory defaults **Now.**

(5)   A message appears, "**Unit Set to Factory Defaults**" – press **Enter** to **Continue**.

9.6. Maintenance Menu

1.   The **Maintenance Menu** provides several options to help Instantel Technical Services diagnose any reported errors.

2.   Select the **Setup** key on the unit to access the main setup selection menu. Use **Down Arrow** key and highlight the **Maintenance Menu** item. Press **Enter** to select **Maintenance Menu**.
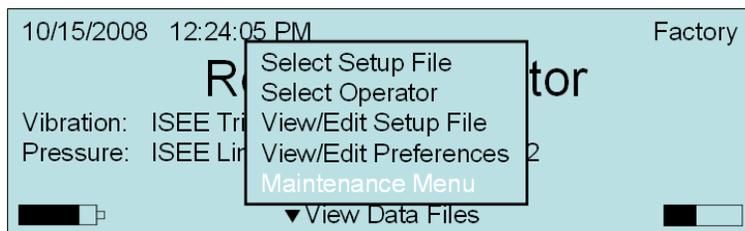
3.   Press the **Up** or **Down Arrow** keys on the unit to highlight **Next/Prev Setup Maintenance Menu** options. Press the **Right Arrow** key to **Action** a Maintenance Menu option. At any time, press the **Cancel** key to return to the previous screen.

```
                        Maintenance
About
View Channel Data
View Battery Data
View Ethernet Data
Self Check                      Now
Disconnect Battery
Zero Offsets
Sound Level Microphone          Field Calibration
■■■▯        ▲▼Next/ Prev  ►Action ✖Cancel      ■■▭
```
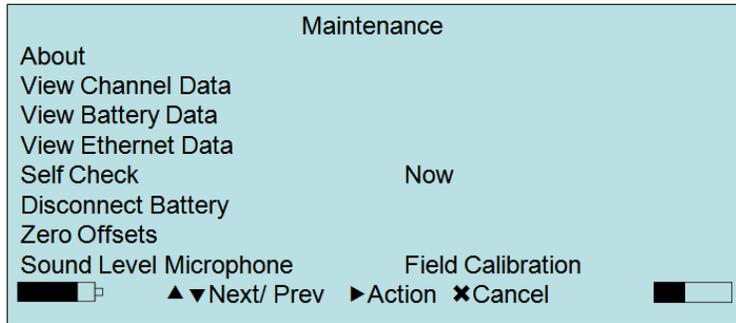
9.6.1. About

The **About** command opens a new screen that displays the following information:

Model and Serial Number

Firmware Release Number and Date

Calibration Date

Free Memory

Battery Percent

(1)   Press the **Right Arrow** key to select the **About** command.

(2)   Press the **Cancel** key to return to the **Maintenance** menu.

9.6.2. View Channel Data

The **View Channel Data** menu is a diagnostic tool that an Instantel Technical Services Representative may ask you to use to describe the information shown.

(1)   Press the **Down Arrow** key to scroll and highlight the **View Channel Data** menu option.

(2)   Press the **Right Arrow** key to enter the **View Channel Data** display menu.

(3)   After a few seconds, the data will appear for Channels 1−3.

(4)   If you are using a Minimate Pro6 unit, you can press the **Enter** key to access the Channel 4−6 data. This includes channel **Value**, **Minimum**, **Maximum**, **Average**, and **Maximum Difference**.

(5)   Press the **Cancel** key to exit the previous menu.

9.6.3. View Battery Data

The **View Battery Data** menu is a diagnostic tool that an Instantel Technical Services Representative may ask you to use to describe the information shown.

(1)   Press the **Down Arrow** key to scroll and highlight the **View Battery Data** menu option.

(2)   Press the **Right Arrow** key to enter the **View Battery Data** display menu.

(3)   Battery data for **Voltage**, **Percent Charged**, **Temperature**, and **Current** is displayed.

(4)   Press the **Cancel** key to exit the previous menu.

9.6.4. View Ethernet Data

The **View Ethernet Data** menu provides information about the **Ethernet** settings, including the **Mac Address**, the status (**Automatic** or **Static**), and the assigned **IP Address**. If the unit is successfully communicating with a network connection, the **Mac Address** and **IP Address** will indicate **Enabled** and **Up**.

(1)   Press the **Down Arrow** key to scroll and highlight the **View Ethernet Data** menu option.

(2)   Press the **Right Arrow** key to enter the **View Ethernet Data** display menu.

(3)   Press the **Cancel** key to exit the previous menu.

9.6.5. Self Check

Select the **Self Check** mode for where you require a record indicating the monitor was operating properly. An Instantel Service Technician may ask you to perform this **Self Check**. This is a diagnostic tool that displays the status of various hardware and software components. The results of the **Self Check** are displayed on four screens on the unit and any items that are tested that do not pass, are listed in the **Monitor Log** as **Failed**. The Service Technician can assist you in determining how to repair or describe a workaround for returning the monitor to a working state.

(1)   Press the **Down Arrow** key to scroll and highlight the **Self Check** menu option.

(2)   Press the **Right Arrow** button to activate **Self Check – Now**.

(3)   Press the **Enter** key to **Continue** to each screen until you are returned to the main display. Review each screen to ensure a **Fail** does not appear.

(4)   A list of diagnostic results will appear with a **Pass** or **Fail** shown next to them. Only items listed with a Fail result will appear in the unit Monitor Log.

9.6.6. Disconnect Battery

Use the **Disconnect Battery** feature if you are planning to store the unit, prepare it for transportation for service or calibration, or if the unit is not performing to standards.

(1)   Select the **Setup** key on the unit.

(2)   Press the **Down Arrow** to scroll and highlight the **Maintenance Menu**. Press the **Enter** key to accept the selection.

04-20-2007, 11:58:05 AM   factory.nsb

R   Change Setup File   tor
                 Change Operator
Vibration: Triaxial   View/Edit Setup File
O/P: Linear M   View/Edit Preferences
                         Maintenance Menu
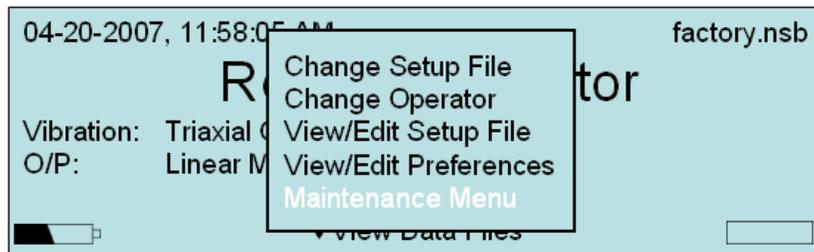
(3)   A message will appear, "Disconnecting the battery will shut the unit down.
        Press the **Right Arrow** key to proceed, or any other key to cancel." Press the
        Right Arrow key and the unit will power off.

9.6.7. Zero Offsets

The **Zero Offsets** menu will monitor the geophone and microphone for 10 seconds and
then analyze the data to determine if there is an offset on any of the channels. If an offset
has been detected, the value associated with this offset will be stored in the unit. This
offset will then be used to correct the data being recorded by adding the stored offset
value to the data. This corrected value is then stored as the event data.

Caution: Ensure there are no vibration or sound signals produced while running this
function as it will negatively affect the results.

(1)

Remove A/D Offsets

Connect desired sensors
i.e. two geophones or 1 geophone + 1 mic

▶ Remove offsets ✖ Cancel
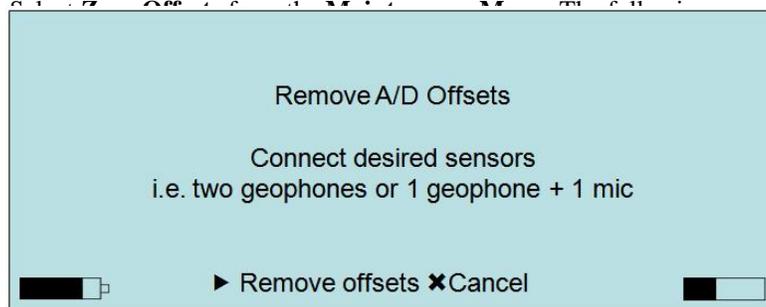
(2) Select the **Right Arrow** key to **Remove Offsets**, or press the **Cancel** key to return to
     the **Maintenance Menu**.
(3) If you have selected to **Remove Offsets**, a message appears, *"Removing A/D offsets.
     Please wait…"*
(4) The unit responds with the message, *"Offsets removed."*
(5) Press **Enter** to **Continue**.

9.6.8. Sound Level Microphone Field Calibration

It is the operator's responsibility to ensure that the optional Class 1 Sound Microphone
(Part No. 720A5101) is calibrated. The following sound microphone calibrators are
recommended: B & K Type 4231, Deltaohm HD 9101 or Rion NC-74.

(1)   Attach the Sound Level Microphone to the Minimate Pro4 or Minimate Pro6,
        as shown below:

Minimate Pro4 (Part No. 720A2301), or
Minimate Pro6 (Part No. 720A2401)

Minimate Pro4
Channel 4, or
Minimate Pro6
Channels 4-6

Sound Level
Microphone
(Part No. 720A5101)
Connected Directly
to Minimate Pro

Minimate Pro4
and Minimate Pro6
Channels 1-3
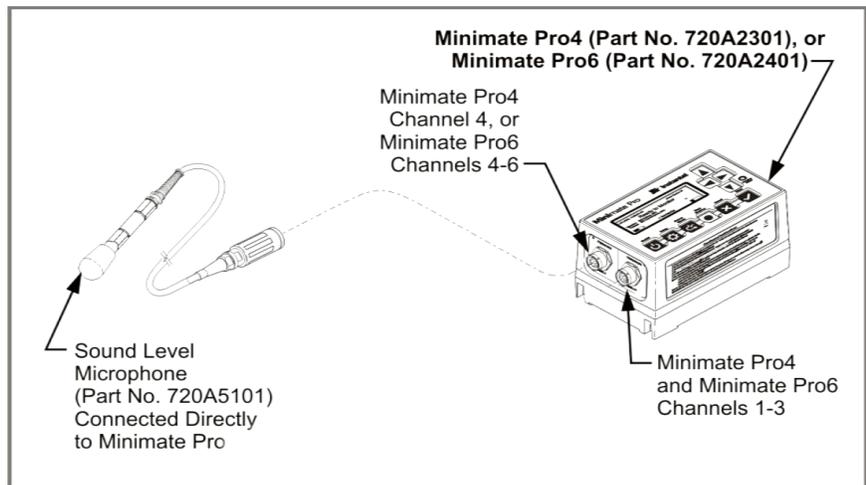
(2)   Select the **Setup** key on the monitor.

(3)   Press the **Down Arrow** key to scroll and highlight the **Maintenance Menu**.

(4)   Press **Enter**.

(5)   Press the **Down Arrow** key to scroll and highlight the **Sound Level Microphone Field Calibration**. Press the **Right Arrow** key to accept the selection.

(6)   The **Calibrate Sound Level Microphone** menu appears. This menu displays the following message, "**The calibration date will be set to:**" and shows the current date.

(7)   Press the **Right Arrow** key to select the **Calibrate** command, or press the **Cancel** key to return to the **Maintenance** menu.

(8)   If the **Calibrate** command was selected, a new prompt appears, "**Connect Sound Level Microphone to Channel 4 – Connect and turn on calibration reference.**"

(9)   Follow the instructions in the operator manual of the field calibration device to attach the field calibration device to the end of the microphone and set the reference to 94dBA.

         NOTE: Remove the windscreen from the Sound Level Microphone before attaching the calibration device.

(10)   Press the **Right Arrow** key to select the **Calibrate** command, or press the **Cancel** key to return to the **Maintenance** menu.

(11)   When complete, the monitor displays one of the following four messages:

         1) If the measured signal is less than 94 dB: **"Error Calibrating Sound Level Microphone. Calibration reference not detected. Existing Calibration retained."**

         2) If the measured signal is greater than 94 dB: **"Error Calibrating Sound Level Microphone. Calibration reference signal too large. Existing Calibration retained."**

         3) If the monitor and field calibration instrument are unable to calibrate the microphone, the following message appears**, "Unable to calibrate the Sound Level Microphone. Please send Microphone to be serviced."**

         4) If the field calibration was successful, the following message appears, **"Sound Level Microphone Calibration successful. Do you wish to use calibration?"**

(12)   Do one of the following:

- To save the calibration results, press the **Right Arrow**.
- To retain the original calibration date, press **Cancel**.

If the changes are accepted, the information will appear on the Event Report showing the Company Name of the Calibrator in the **"Field Calibration"** field. Refer to the Operator Manual of the Instantel software you are using for more information.

10. SENSORS

10.1. Calibration Overview

10.1.1. Why Calibration is Important

Calibration is important to ensure the instrument is performing as it was designed to, and measures accurately the true ground vibration and air overpressure. The recommended interval for calibration of most measuring equipment including seismographs is one year. Across most of North America and many parts of Europe regulatory authorities actually require vibration monitors to be calibrated on an annual basis. This requirement has been or is being adopted by several other countries around the world and some specific projects even require that seismographs be calibrated every three or six months.

10.1.2. What the Calibration Certificate Means

Should an authority question your vibration records, a Calibration Certificate is the document that provides proof of professional calibration. When your vibration monitor is calibrated at Instantel, a Calibration Certificate is issued. To ensure the validity of each calibration, the reference equipment used is also calibrated and is traceable to a nationally recognized standard, such as the National Institute of Standards and Technology (NIST) in the United States, or the National Research Council (NRC), in Canada. The calibration certificate also contains the model, serial number, and date the instrument was calibrated, and who performed the calibration.

10.1.3. Importance of Manufacturer Certified Calibration

Using a manufacturer certified facility ensures that proper procedures are followed when calibrating your vibration monitor. This removes any uncertainty associated with the reliability and measurement accuracy of your monitor, and ensures the integrity of the measured record if it is ever called up as evidence in a court of law. There are individuals and companies worldwide that are not certified by the manufacturer to perform vibration monitor calibration, yet continue to do so. It is in your best interest to have your monitor calibrated by the specific manufacturer or their authorized agents. Using unauthorized facilities may cause problems in court if the reference equipment is not traceable, or if the certification documents are incomplete.

10.1.4. Minimate Pro Sensor Check Feature

The only purpose of the **Sensor Check** feature on Instantel vibration monitors, is to ensure that the sensors have been connected and installed correctly. If a sensor was not level, or was upside down, the monitor would indicate a failed Sensor Check. The Sensor Check is NOT a calibration check and cannot replace the annual calibration process. Sensor Check does not compare the measured result against an external traceable reference sensor, nor does it test the entire electronic circuit that is integral to the sensor's response.

10.2. References to Minimate Pro4 and Minimate Pro6

The Minimate Pro6 monitor offers additional flexibility for compliance monitoring. On the Minimate Pro6, a second Geophone may be connected to the channel labeled **PRESSURE**, instead of a Microphone. On the Minimate Pro4 monitor, this channel is labeled **PRESSURE** and is solely used for overpressure monitoring using the Linear Microphone. These channels are also labeled within the display and **View/Edit** setup file, depending on which instrument you have purchased.

10.3. Series IV Sensor Specifications

SPECIFICATION	SERIES IV SENSOR			
	DIN Geophone (1-315 Hz)	DIN Geophone (1-80 Hz)	ISEE Geophone	Standard Overpressure Microphone
Part Number	720A2002	720A2003	720A2001	720A1801
Frequency Weighting	N/A	N/A	N/A	Linear
Response Standard	DIN 45669-1 Class 1	DIN 45669-1 Class 1	ISEE Specification 2009 Edition	ISEE Seismograph Specification
Operating Frequency Range	1 to 315 Hz	1 to 80 Hz	2 to 250 Hz	2 to 250 Hz
Velocity Range	Up to 254 mm/s (10 in/s)	Up to 254 mm/s (10 in/s)	Up to 254 mm/s (10 in/s)	N/A
Amplitude Range	N/A	N/A	N/A	88 to 148 dB (2-500 Pa)
Resolution	0.00031 mm/s (0.00788 in/s)	0.00031 mm/s (0.00788 in/s)	0.00031 mm/s (0.00788 in/s)	0.0155 Pa (0.01 dB)
Sensor Density	2.13 g/cc (133 lbs/ft^3)	2.13 g/cc (133 lbs/ft^3)	2.13 g/cc (133 lbs/ft^3)	N/A
Standard Cable Length	1.8 m (6 ft)	1.8 m (6ft)	1.8 m (6 ft)	1.8 m (6 ft)
Maximum Length of Cable Extensions	989 m (3250 ft)	989 m (3250 ft)	75 m (250 ft)	75 m (250 ft)

10.4. Installing an ISEE or DIN Geophone

The following sections apply to the Minimate Pro with a Series IV ISEE or DIN Geophone, as supplied by Instantel. To help differentiate between the two geophone types, the DIN Geophone has a blue lid, whereas the ISEE Geophone has a silver lid.

The sections illustrate installation procedures recommended by Instantel. Your particular monitoring activities may employ one or a combination of all of the following procedures. You may even devise your own method for a specific application. It is important for you to securely attach the Geophone to the Minimate Pro to ensure reliable monitoring results.

The following sections provide example installation methods. For wall and ceiling installations, refer to the Reference chapter.

1. Arrow Pointed in Direction of the Event

The arrow on top of the Geophone must be pointed in the direction of the Event to ensure the geophone sensors, located inside, remain in their natural axis.

2. Level Installation

The Geophone must be level when installed. A leveling plate is available to install the Geophone. Both the fastening plate and the leveling plate have three leveling feet and an integrated bubble level indicator.

3. Securely Coupled to the Surrounding Surface

The Geophone must be securely attached to the ground with the provided spikes, or buried. The surface must be compact with no loose or soft material close to the Geophone. Secure attachment is critical for reliable and accurate monitoring results. Insufficiently secured, and the Geophone

will move independently of the surrounding surface resulting in distorted, often higher, monitoring results.

Installation methods depend upon the type of surface. It is up to you to check the surface and mount the geophone sufficiently to ensure reliable monitoring results.

10.4.1. Soft Surface Installations

Always install and use the ground spikes provided with the geophone. For the best installation, it is suggested to bury the geophone, or for very low level velocities, place a sandbag on top of it.

a. Burying and using the Ground Spikes with the Geophone

1. Screw the three ground spikes into the bottom of the Geophone and tighten.

   NOTE: Do not over-tighten the ground spikes as this can damage the casing of the Geophone.

2. Dig a hole from four inches (10 cm) to six inches (15 cm) deep.

3. Aim the arrow on the top of the Geophone in the direction of the Event.

4. Firmly press on top of the Geophone to push the spikes fully into the ground. Check the Geophone to ensure it is securely in place and level.

5. The ground must be hard and compact with no loose material between the Geophone and the compact ground material.

6. Compact the material around the Geophone while back filling to secure it to the surrounding ground material.

7. Ensure that the Geophone is securely attached to the **Vibration** port on the Minimate Pro.

8. Press the **Sensor Check** key on the Minimate Pro to ensure that the sensor is properly attached.

b. Sandbagging the Geophone –Very Low Velocity Levels Only

Use this method of installation for monitoring where velocity levels remain very low.

10 Lbs (4.5 kg) Sandbag
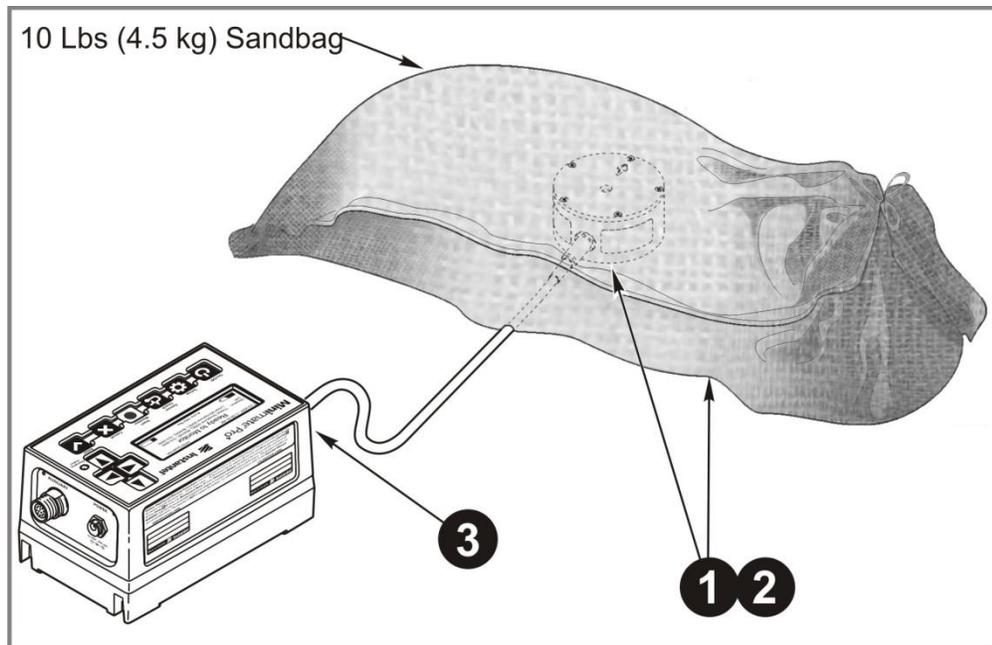
Refer to the illustration above and follow the installation instructions below:

1. The sandbag must be of sufficient size to cover the entire Geophone and the surrounding surface.

2. The sandbag should weigh at least 25 pounds (12 kg) and contain sand or 1/4" washed gravel.

3. Ensure that the Geophone is securely attached to the **Vibration** port on the Minimate Pro.

4. Press the **Sensor Check** key on the Minimate Pro to ensure that the sensor is properly attached.

10.4.2. Hard Surface Installations

For hard surface installations, such as rock, concrete or solid ice, the preferred installation method bolts the Geophone directly to the surface.

a. Bolting the Geophone Directly to a Surface

A Series Geophone may be bolted directly to a surface using the provided thru-hole, with the aid of the optional leveling plate, or the Geophone Wall Mount Kit.

(1)   **Geophone Direct Hard Surface Mount Installation Instruction**

Tools and Materials Required:

1. Hammer

2. Drill bit and drill for bolt or threaded rod

3. 3/8 inch (9.5 mm) wrench

4. 3/8 inch (9.5 mm) bolt or threaded rod

5. 3/8 inch (9.5 mm) retaining washer, lock washer, and nut
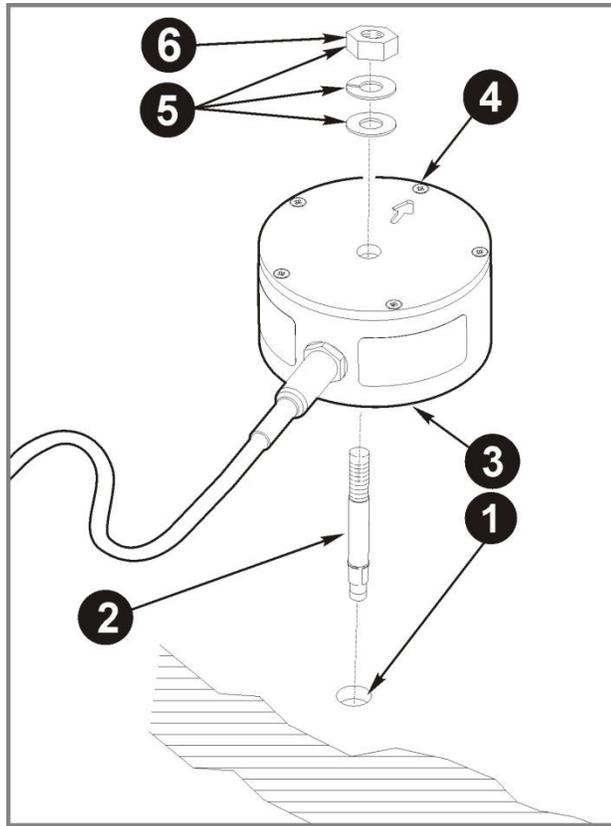
Refer to the illustration above and follow the installation instructions below:

> **NOTE:** If the Geophone is being mounted to the ceiling, the directional arrow must be mounted against the ceiling's surface to ensure that the orientation of the internal vertical transducer is correctly positioned. If it is not correctly positioned, the **Sensor Check** feature of the unit will indicate that the position of the Geophone needs to be checked.

1. Position the Geophone on the surface and mark the position of the bolt hole, which is located at the center of the Geophone.
2. Use a 3/8 inch (9.5 mm) bolt or threaded rod. Install the bolt into the hard surface according to the manufacturer's instructions.
3. Slide the Geophone over the bolt.
4. Ensure that the arrow on the Geophone is pointing in the direction of the Event.
5. Place a 3/8 inch (9.5 mm) retaining washer, lock washer, and nut over the bolt.
6. Carefully tighten the retaining nut to complete the installation.
7. Ensure that the Geophone is securely attached to the **Vibration** port on the Minimate Pro.
8. Press the **Sensor Check** key on the Minimate Pro to ensure that the sensor is properly attached.

(2)   **Geophone Leveling Plate Installation Instruction**

Tools and Materials Required:

1. Triaxial Geophone Leveling Plate Kit (Part No. 714A1801)

2. Hammer, drill bit and drill for bolt or threaded rod

3. 3/8 inch (9.5 mm) wrench

4. 3/8 inch (9.5 mm) bolt or threaded rod

5. 3/8 inch (9.5 mm) retaining washer, lock washer, and nut
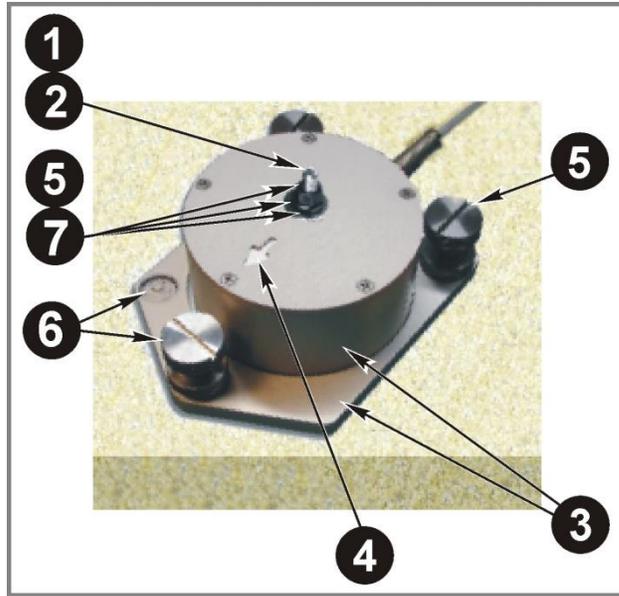
Refer to the illustration above and follow the installation instructions below:

1. Position the Geophone with leveling plate on the surface and mark the position of the bolt hole, which is located at the center of the Geophone.
2. Use a 3/8 inch (9.5 mm) bolt or threaded rod. Install the bolt into the hard surface according to the manufacturer's instructions.
3. Slide the Geophone and leveling plate over the bolt.
4. Ensure that the arrow on the Geophone is pointing in the direction of the Event.
5. Place a 3/8 inch (9.5 mm) retaining washer, lock washer, and nut over the bolt but do not tighten.
6. Level the Geophone using the leveling feet and integrated bubble level.
7. Carefully tighten the retaining nut to complete the installation.
8. Ensure that the Geophone is securely attached to the **Vibration** port on the Minimate Pro.
9. Press the **Sensor Check** key on the Minimate Pro to ensure that the sensor is properly attached.

(3)   Geophone Wall Mount Kit Installation Instruction

Tools and Materials Required:

1. Geophone Wall Mount Kit (Part No. 718A0101)

2. Hammer

3. 19 mm (3/4 inch) deep-throated socket and ratchet

4. 13 mm (1/2 inch) wrench

5. 12 mm (.47 inch) drill bit and drill

   NOTE: To install the Geophone Wall Mount, depending on your application, you may need to acquire alternative mounting hardware than what has been provided with the kit.
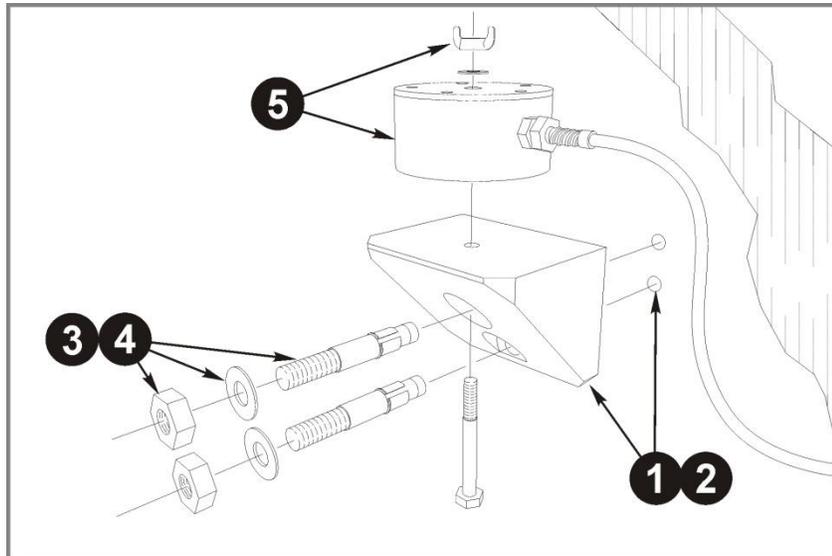
Refer to the illustration above and follow the installation instructions below:

1. Using the Geophone Wall Mount as a template, orient the block as shown, and mark the location of the two holes to be drilled.

2. Remove the Geophone Wall Mount, and drill two 12 mm (.47 in) diameter holes; drill the holes to a depth of 89 mm (3.50 in).

3. Place a nut on the end of each wedge anchor bolt to protect the threads, and using a hammer, securely drive each bolt into place. Ensure that at least 32 mm (1.25 ins) of each of the wedge anchor bolt threads extend from the wall.

4. Remove the nuts from the wedge anchor bolts, and reposition the Geophone Wall Mount. Secure it using two washers, the two nuts previously removed, and a deep-throat socket with a ratchet.

5. Position the Geophone (not included in the kit) on top of the Geophone Wall Mount, aligning the through-hole of the geophone with the mount; secure it using the bolt, washer, and wing nut. Ensure that the arrow on the ISEE Geophone is pointing in the direction of the event. Hand-tighten the wing nut – DO NOT use a wrench or pliers to tighten the wing nut, as this may damage the Geophone.

6. Ensure that the Geophone is securely attached to the **Vibration** port on the Minimate Pro.

7. Press the **Sensor Check** key on the Minimate Pro to ensure that the sensor is properly attached.

10.4.3. Geophone Theory of Operation

This section describes how Instantel's geophones operate. A geophone measures ground vibrations. The actual mechanism inside the geophone is called a transducer. Geophones with one transducer are called Uniaxial Geophones; geophones with three transducers are called Triaxial Geophones.

a. Geophone Operation

Functionally, a geophone sensor is a coil of wire suspended around a magnet. The magnet is free to move in a field of magnetic flux lines. By Lenzs' Law, induced voltage is proportional to the speed at which flux lines are traversed. Induced coil voltage is therefore proportional to the

relative velocity of the coil to the magnet. In practice, it does not matter whether the coil or the magnet moves. Only the motion and speed relative to each other are important.
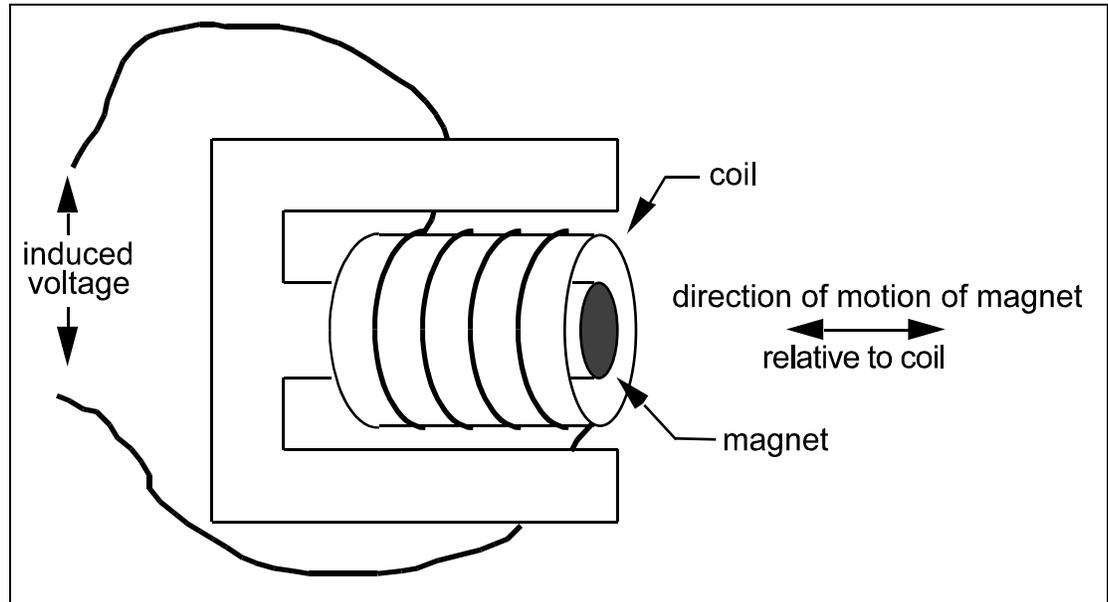
Figure 10.1 Geophone Sensor Operation.

Geophone sensor specifications give a number known as the Intrinsic Voltage Sensitivity. It is the coil voltage induced for a given coil versus magnet speed with units of V/in/s. In seismic applications, the magnet is moved by the blast energy because it is coupled to the particles of the surrounding terrain. The coil, because of its inertia, does not move and the resulting magnet versus coil motion induces a voltage that is proportional to particle velocity.

b. Geophone Calibration Requirements

Instantel's Geophones must be calibrated annually by Instantel or an Authorized Instantel Service Facility. Contact your dealer for further information.

10.5. Installing the ISEE Microphone

(1)   **Microphone Installation Procedure**

Tools and Materials Required:

  1.   Rubber Mallet, as required
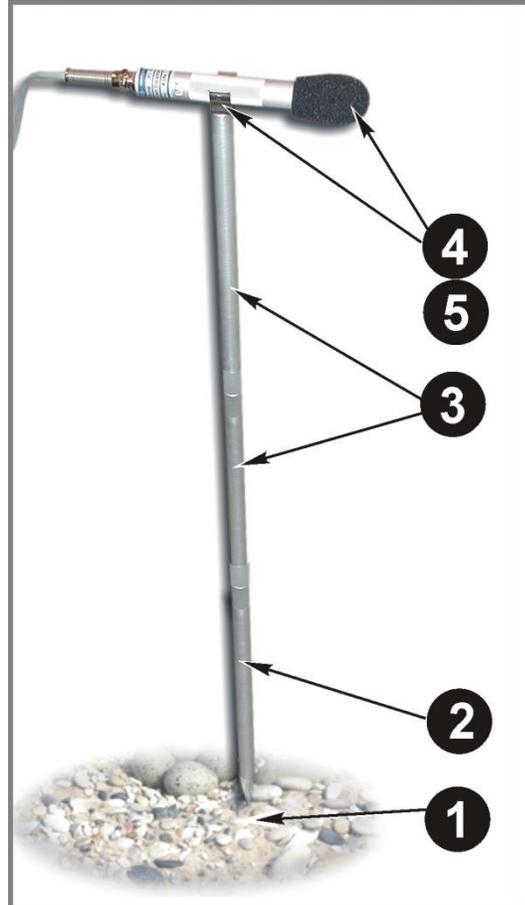
Refer to the illustration above and follow the installation instructions below:

Instantel Series IV Microphones come with a sectional three foot (one meter) mounting stand.

1.   Locate the position of interest where you will be inserting the mounting stand.
2.   If required, use a rubber mallet to insert the lower part of the sectional mounting stand into the ground.
3.   Assemble the remainder of the mounting stand by adding, as required, the two threaded sectional pieces.
4.   Insert the microphone into the mounting bracket on the top of the stand, and attach the windscreen to reduce false triggering caused by wind.
5.   Point the microphone in the direction of the event.
6.   Ensure that the Microphone is securely attached to the **Vibration** port on the Minimate Pro.
7.   Press the **Sensor Check** key on the Minimate Pro to ensure that the sensor is properly attached.

NOTE: The microphone windscreen attenuates the microphone reading by 0.2 dB. In most cases, this does not have a material impact on results.

WARNING: Handle the microphone with care. Dropping the microphone or otherwise subjecting it to impact may damage the microphone element. The windscreen can help to protect the microphone, and its use is recommended.

10.5.2. Microphone Theory of Operation

This section describes how the ISEE Linear Microphone operates. The ISEE Linear Microphone measures air pressure.

a. Measurement Scales

The Minimate Pro supports the Linear "L" sound pressure measurement scale.

(1)   **Linear "L"**

Linear measurement is generally used to measure the effect of low frequency air pressure on buildings. The linear scale records sound pressure without modification in the 2 to 300 Hz range. Measurement units may be in absolute, Pascal, or relative dB scales.

b. Microphone Calibration Requirements

Instantel's ISEE Linear Microphone must be calibrated annually by Instantel or an authorized Instantel service facility. Contact your dealer for further information.

11. OPERATOR MAINTENANCE

11.1. Operator Maintenance

Several levels of maintenance are available for the Minimate Pro with each level being dependent on the type of repair required. Any maintenance not outlined below must be performed by your Instantel Dealer Representative or Calibration Site, or the Instantel Service Department. Any maintenance performed on the unit that is not included in the list below will void the warranty as specified at the beginning of this manual. Refer to Chapter 3, Handling Precautions prior to performing any maintenance procedures.

The following outlines the maintenance procedures that may be performed by the Operator:

- **Storage**
  When storing the instrument, ensure that you charge the battery for at least 24 hours and then use the **Disconnect Battery** command within the Maintenance Menu.

- **Replace Power Adapter**
  If required, replacement power adapters are available from your Instantel Dealer Representative or directly from Instantel.

- **Reload Operating System**
  To complete a field repair, a new version of the unit operating system must be downloaded to the Minimate Pro. If a new version of software is provided, refer to the Operator Manual for your software and follow the instructions for Reloading the Operating System.

- **Periodic Cleaning**
  Use compressed air to remove loose dirt and surface dust. Vacuum dust, dirt, and sand from the Minimate Pro monitor keypad area. Use alcohol to remove stains. **DO NOT** use paint thinners and ketone solvents. These will damage the Minimate Pro. To avoid scratching the protective cover and display, do not scrub the surfaces with abrasive cleaning materials including cleaning pads.

- **Replace Dust Caps**
  If required, replacement dust caps for the connectors on the unit are available from Instantel. Replacement dust caps located on the sensor cables must be replaced at an authorized repair facility or at Instantel.

- **Maintenance as directed by an Instantel Service Technician**
  Occasionally, an Instantel Service Technician may authorize an in-field repair by the Operator. Typically, an instruction sheet is provided and the technician guides the Operator through the procedure.

NOTES:

12. TECHNICAL REFERENCE

12.1. Anti-alias Filters

Aliasing occurs when a high-frequency signal appears as an erroneous low frequency because the waveform was sampled at too low a sampling rate. An anti-aliasing filter solves this problem by removing the high-frequencies.

12.2. Data Analysis Techniques

The following sections define the Minimate Pro data analysis techniques. The first section, ground vibrations, discusses calculations applied to event data recorded by a geophone. The second section, sound pressure, describes the Linear Microphone Event data calculations.

12.2.1. Ground Vibrations

The Minimate Pro calculates the Peak Particle Velocity, Zero Crossing Frequency, Peak Acceleration, and Peak Displacement for each of the, transverse, vertical, and longitudinal axis. The Minimate Pro calculates Peak Vector Sum using data from all three axis.

a. Peak Particle Velocity (PPV)

Peak Particle Velocity indicates the maximum speed particles travel resulting from an Event's ground vibrations. The Minimate Pro calculates the PPV for each geophone.
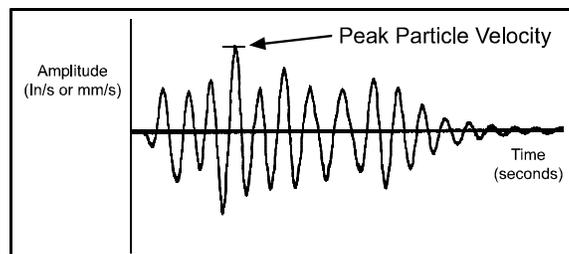
Calculating Peak Particle Velocity

b. Zero Crossing Frequency (ZC Freq)

The Zero Crossing Frequency calculates the Event waveform's frequency at the largest peak.

(1)   Calculating Zero Crossing Frequency

To calculate the Zero Crossing Frequency, we need to determine the period of oscillation of the waveform. Convenient waveform positions for measuring period, the time for one complete cycle, occur between two successive peaks, troughs, or zero crossings. The Minimate Pro measures between zero crossings. Frequency is the number of periods that occur in one second calculated by the formula: Frequency = 1/period.
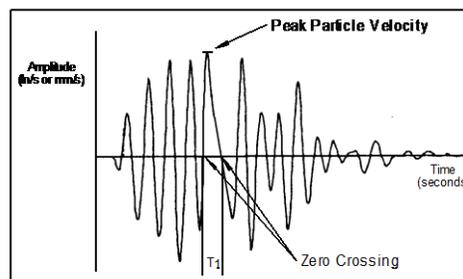
Calculating the Zero Crossing Frequency

(2)   Zero Crossing Frequency Limitation

The Zero Crossing Frequency calculation is limited because it assumes a single predominant frequency at the peak, typically represented by sinusoidal waveforms. In practice, the peak may be

the result of two or more major frequency components representing compound waveforms as illustrated in the figure below. It is therefore only an approximation of the frequency of the Peak Particle Velocity.

Waveforms may have the same Peak Particle Velocities but different Zero Crossing Frequencies depending on the shape of the waveforms involved. With reference to the figures above and below; both waveforms have the same Peak Particle Velocities however their Zero Crossing Frequencies differ. In the figure above, the zero crossing frequency uses the 1/2 period indicated by T_1. In the figure below, the zero crossing frequency uses the 1/2 period indicated by T_2. Notice that T_1 is less than T_2 because of the different waveform shapes, therefore the Zero Crossing Frequency in the figure above is greater than the Zero Crossing Frequency in the figure below. It is for this reason, the Zero Crossing Frequency may differ for peaks having the same Peak Particle Velocity.
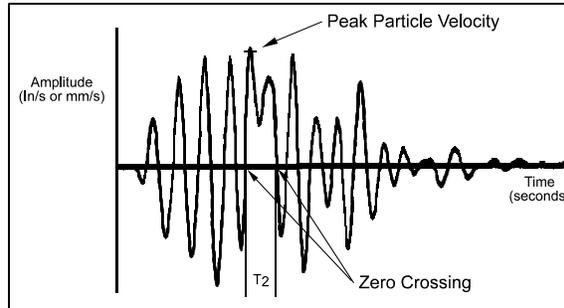
Zero Crossing Frequency Calculation Limitation

(3) Sample Rate Error

The Zero Crossing Frequency requires the period of a wavelength before it can calculate the wavelength's frequency using the formula 1/period. A sampling error occurs for higher frequencies when wavelength periods become relatively small and the sampling rate begins to miss zero crossing points. In other words, the wavelength periods occur much faster than a Minimate Pro can sample and use in the calculation.

At higher frequencies there are fewer sample points per cycle and therefore greater error. The following table illustrates how error increases with frequency.

Zero Crossing Frequency Sample Error Rate			
Frequency Range	Recording Rate		
	Standard (1024 Hz)	Fast (2048 Hz)	Faster (4096 Hz)
0 – 30 Hz	Negligible error	Negligible error	Negligible error
31 – 50 Hz	Up to 5 Hz error	Up to 2.5 Hz error	Negligible error
51 – 70 Hz	Up to 8 Hz error	Up to 4 Hz error	Up to 2 Hz error
71 – 90 Hz	Up to 18 Hz error	Up to 9 Hz error	Up to 4.5 Hz error
91 – 150 Hz	Up to 50 Hz error	Up to 25 Hz error	Up to 12.5 Hz error

The **Minimate Pro** does not calculate frequencies above 100 Hz because of the high error level at 1024 samples per second. The message ">100 Hz" displays. Furthermore if a waveform is very

complex, or if it contains a large offset value, the zero crossings may lie outside an acceptable window. Whenever a frequency cannot be calculated the message "<1 Hz" displays. The message N/A indicates an entire waveform was not captured and therefore no frequency could be calculated. More accurate analysis is available using the THOR or Blastware software.

c. Peak Acceleration

The Minimate Pro calculates peak acceleration, the rate of change of velocity, by dividing the difference in velocity by the difference in time. To obtain the peak acceleration, the Minimate Pro subtracts two velocity readings and divides the result by the elapsed time between them.

$$a = \frac{dV}{dT} \approx \frac{\Delta V}{\Delta T}$$

where:

$$\Delta T = \text{a small interval}$$

The Minimate Pro calculates the peak acceleration at each point along the entire waveform and reports the peak value. Note that this is not necessarily at the peak velocity for an individual waveform.

d. Peak Displacement

The Minimate Pro calculates peak displacement, or particle distance traveled, by multiplying speed by time. In the Minimate Pro the interval velocity is multiplied by the time interval and the resulting displacement segments are summed.

$$s = \int V dt \approx \sum (V \Delta t)$$

where:

$V =$ the velocity in each interval

To obtain the peak displacement, the Minimate Pro integrates each wave segment of the entire waveform between zero crossings, selects the largest, then divides the value by half. Note that this is not necessarily at the peak velocity of the waveform.

e. Peak Vector Sum (PVS)

The figure below displays three event waveforms. The figure illustrates the procedure of graphically calculating peak vector sums. Measured magnitudes are tabulated for six different times and represent velocities in each of the three axes. The vector sum represents the resultant particle velocity magnitude and is calculated by squaring and adding the magnitudes and taking the square root.

$$PVS = \sqrt{T^2 + V^2 + L^2}$$

where:

$T \;=\;$ particle velocity along the transverse plane

$V \;=\;$ particle velocity along the vertical plane

$L \;=\;$ particle velocity along the longitudinal plane

EVENT WAVEFORMS			MAGNITUDE			PEAK VECTOR
TRANSVERSE	VERTICAL	LONGITUDINAL	T	V	L	
			-0.34	-0.33	0.14	0.494
			0.38	-0.47	0.38	0.714
			0.29	-0.31	0.51	0.663
			-0.53	0.23	-0.31	0.655
			0.24	0.07	0.36	0.440
			-0.23	-0.16	-0.15	0.318
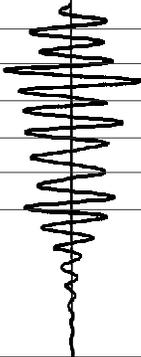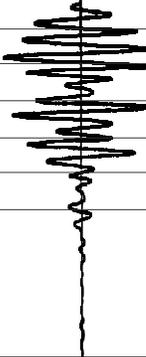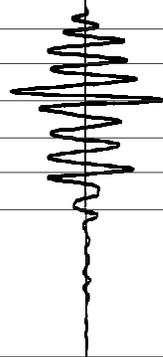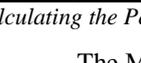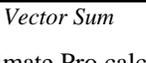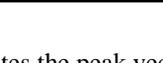
Calculating the Peak Vector Sum

The Minimate Pro calculates the peak vector sum for each point of the sampled waveforms and displays the largest value. Note that this is not necessarily at the peak velocity for an individual waveform.

12.2.2. Sound Pressure

The Minimate Pro calculates two sound pressure indicators, peak sound pressure and zero crossing frequency.

a. Peak Sound Pressure (PSP)

The Minimate Pro checks the entire event waveform and displays the largest sound pressure called the Peak Sound Pressure (PSP), also referred to as the Peak Air Over–Pressure. Results appear on the Minimate Pro display.

b. Zero Crossing Frequency (ZC Freq)

The Zero Crossing Frequency calculation for sound pressure is the same calculation used for ground vibrations. Please see above for a complete discussion.

Note: The Zero Crossing Frequency calculation is performed for ISEE Linear "L" Microphones.

12.2.3. Sinusoidal Waveforms

The motion is essentially sinusoidal with gradual amplitude and frequency changes.
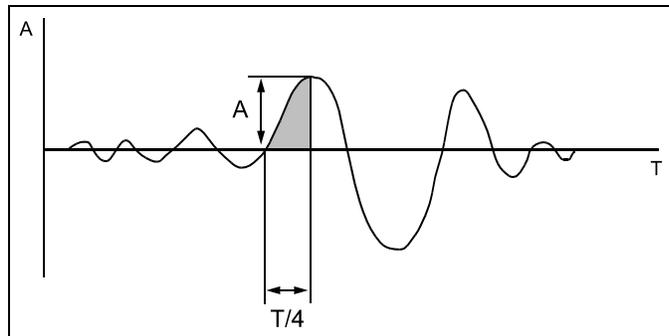
Manual Waveform Calculations on Sinusoidal Waveforms

a. Calculating Displacement:

Maximum Displacement (in.) $= \dfrac{T}{2\pi} \times A$

$$\text{Maximum Displacement (mm)} \quad = \quad \frac{T}{2\pi} \times A_m$$

b. Calculating Acceleration:

$$\text{Maximum Acceleration (in./s}^2) \quad = \quad \frac{2\pi}{T} \times A$$

$$\text{Maximum Acceleration (mm/s}^2) \quad = \quad \frac{2\pi}{T} \times A_m$$

12.2.4. Nearly Triangular Waveforms

Motion is irregular and has large amplitude.
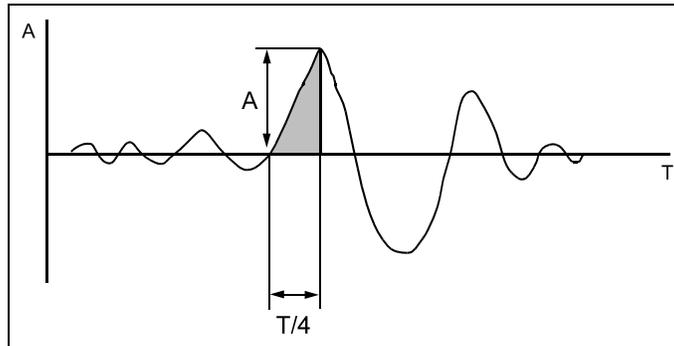
Manual Waveform Calculations on Nearly Triangular Waveforms

a. Calculating Displacement:

$$\text{Maximum Displacement (in.)} \quad = \quad \frac{T}{8} \times A$$

$$\text{Maximum Displacement (mm)} \quad = \quad \frac{T}{8} \times A_m$$

b. Calculating Acceleration:

$$\text{Maximum Acceleration (in./s}^2) \quad = \quad \frac{1}{T} \times Y$$

$$\text{Maximum Acceleration (mm/s}^2) \quad = \quad \frac{1}{T} \times Y_m$$

12.2.5. Compound Waveforms

If the record exhibits interference by two or more predominant frequencies, then the maximum displacement will be the sum of the maximum of each individual frequency component.
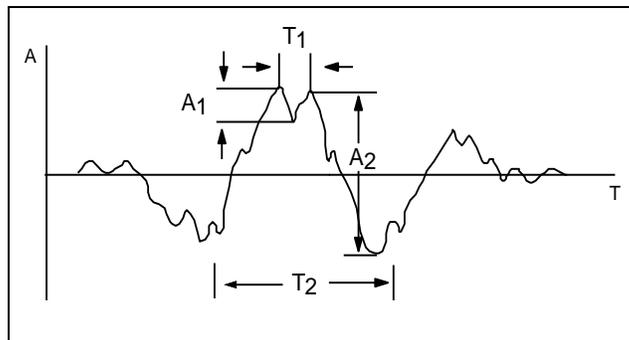
a. Calculating Displacement:

Maximum Displacement (in.) $\qquad = \dfrac{T_1}{2\pi} \times A_1 + \dfrac{T_2}{2\pi} \times A_2$

Maximum Displacement (mm) $\qquad = \dfrac{T_1}{2\pi} \times A_{1m} + \dfrac{T_2}{2\pi} \times A_{2m}$

b. Calculating Acceleration:

Maximum Acceleration (in./s^2) $\qquad = \dfrac{2\pi}{T_1} \times A_1 + \dfrac{2\pi}{T_2} \times A_2$

Maximum Acceleration (mm/s^2) $\qquad = \dfrac{2\pi}{T_1} \times A_{1m} + \dfrac{2\pi}{T_2} \times A_{2m}$

12.2.6. Irregular Waveforms
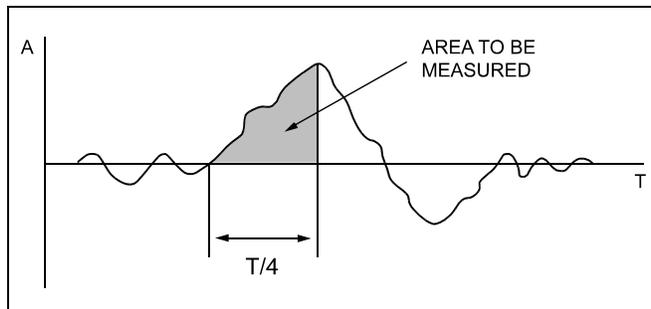
Manual Waveform Calculations on Irregular Waveforms

a. Calculating Displacement:

Maximum Displacement = area under curve measured by a planimeter.

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