

Minimate™ Blaster

Operator Manual



Certified to the ISO 9001 Quality Standard

Instantel® Inc.

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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 III monitors (**Blastmate® III**, **Minimate™ Blaster**, and **Minimate Plus™**) 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 A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.



Table of Contents

Thank You	v
Before You Begin.....	v
Check the Package Contents.....	v
Record the Minimate Blaster Identification Numbers	v
Check Your Local Electric Power Supply	v
Connect the Battery	vi
Charge the Battery	vi
Check the Monitor's Memory	vii
Complete Your Registration Card or Register Online.....	vii
Handling Precautions.....	vii
Condensed Instructions.....	viii
Conventions Used throughout this Manual	ix
Notes:.....	x
1. Introduction.....	1-1
1.1. Minimate Blaster Features and Benefits	1-1
1.2. Accessories	1-2
1.3. Minimate Blaster Keys	1-3
2. Basic Tutorial	2-1
3. The Minimate Blaster.....	3-1
3.1. Explanation of Sensor Orientation.....	3-1
3.2. Installing the Standard Transducer	3-1
3.2.1. Soft Surface Installation.....	3-2
3.2.2. Hard Surface Installation	3-3
3.3. Installing the Microphone.....	3-4
3.4. The Minimate Blaster Keyboard.....	3-4
3.5. Enter * Key	3-4
3.6. Start Monitor Key	3-5
3.7. Setups Key	3-5
3.7.1. Record Mode.....	3-5
3.7.2. Sample Rate	3-5
3.7.3. Storage Mode	3-6
3.7.4. Maximum Geo Range	3-6
3.7.5. Trigger Source	3-6
3.7.6. Trigger Level	3-6
3.7.7. Record Stop Mode	3-7
3.7.8. Record Time	3-7
3.7.9. Notes Format.....	3-7
3.7.10. Job Number Format	3-8
3.7.11. Scaled Distance.....	3-8
3.7.12. Time	3-8
3.7.13. Date.....	3-9



- 3.8. Right Arrow Key + Setups Key 3-9
 - 3.8.1. Timer Mode..... 3-9
 - 3.8.2. Daily Self Check 3-10
 - 3.8.3. Sensorcheck 3-10
 - 3.8.4. Measurement System 3-10
 - 3.8.5. Basic Channels 3-11
 - 3.8.6. Microphone Units 3-11
 - 3.8.7. Geo Alarm Level..... 3-11
 - 3.8.8. Mic Alarm Level..... 3-11
 - 3.8.9. Serial Connection 3-11
 - 3.8.10. Direct Baud Rate or Modem Baud Rate..... 3-12
 - 3.8.11. Beep When Triggered 3-12
- 3.9. Up Arrow Key..... 3-12
 - 3.9.1. View Events 3-12
 - 3.9.2. Delete All Events 3-13
 - 3.9.3. Print Event List 3-13
 - 3.9.4. Print Selected Event 3-14
 - 3.9.5. Print All Events 3-14
 - 3.9.6. Upload One Event..... 3-14
 - 3.9.7. Upload All Events 3-14
 - 3.9.8. Copy BMIII Notes..... 3-15
- 3.10. Cancel Key..... 3-15
- 3.11. Test Key 3-15
- 3.12. Option Key..... 3-16
 - 3.12.1. Option Key + Setups Key 3-16
 - 3.12.2. Option Key + Test Key = Review Setups 3-18
 - 3.12.3. Option Key + Enter Key = On-Line Help 3-18
 - 3.12.4. Option Key + Cancel Key = Backlight ON..... 3-18
 - 3.12.5. Option Key + Up Arrow Key = Down Arrow 3-18
 - 3.12.6. Option Key + Right Arrow Key = Left Arrow 3-18
- 3.13. Right Arrow Key..... 3-18

4. Reference4-1

- 4.1. Additional Installation Procedures 4-1
 - 4.1.1. Standard Transducer Wall Installation 4-1
 - 4.1.2. Standard Transducer Ceiling Installation 4-2
- 4.2. Theory of Operation..... 4-3
 - 4.2.1. Transducer..... 4-3
 - 4.2.2. Microphone 4-4
- 4.3. Sensorcheck 4-5
 - 4.3.1. Checking the Standard Transducer Geophones 4-5
 - 4.3.2. Checking the Microphone 4-6
 - 4.3.3. Sensorcheck Report..... 4-6
- 4.4. Anti-alias Filters..... 4-6
- 4.5. Data Analysis Techniques..... 4-6
 - 4.5.1. Vibrations..... 4-6
 - 4.5.2. Pressure 4-10
- 4.6. Alternate Manual Waveform Calculations..... 4-10
 - 4.6.1. Sinusoidal Waveforms 4-11
 - 4.6.2. Nearly Triangular Waveforms 4-11
 - 4.6.3. Compound Waveforms 4-12
 - 4.6.4. Irregular Waveforms 4-13

Notes:4-14



5. Maintenance 5-1

- 5.1. Battery Charging.....5-1
- 5.2. Annual Calibration Requirements5-2
- 5.3. Cleaning the Minimate Blaster5-2

6. Troubleshooting 6-1

Appendix 1

- a) Minimate Blaster Specifications The Minimate Blaster is fully compliant with the International Society of Explosives and Engineers (ISEE) performance specifications for blasting seismographs.....2
- b) Parts and Accessories3
- c) Compliance Reports4
- d) Calculating Battery Life5
- e) Connecting a Printer to the Minimate Blaster5

Notes:..... 8

Index 1



Notes:



Thank You ...

*Thank you for purchasing InstanTel's **Minimate™ Blaster**. If this is your first InstanTel seismograph, welcome to the new World Standard set by InstanTel. If this seismograph adds to your existing fleet, congratulations! You will find the features simple to use and offer you powerful control over your monitoring operations.*

Before You Begin

Before you begin using your new **Minimate Blaster**, please complete the following. It only takes a few minutes of your time and ensures your monitor is ready for operation and that you become part of InstanTel's Product Support Program.

Important information appears within the **Blastware®** software Readme file. Install the **Blastware** software then read this file for additional information. See the **Blastware** Operator Manual for installation instructions.

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. It is an important component of what you have just purchased.

Record the Minimate Blaster Identification Numbers

Record the following identification numbers for future reference.

IDENTIFICATION NUMBERS	
Model Number	
Monitor Serial Number	
Monitor Software Version Number	
Standard Transducer Serial Number	
Microphone Serial Number	
Dealer Name	
Date Purchased	

Check Your Local Electric Power Supply

Every **Minimate Blaster** comes with a 120 VAC 60 Hz input AC adapter providing 10 to 14 VDC, 500 mA 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 Blaster**. 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 @ 500 mA to power the monitor.

Connect the Battery

The **Minimate Blaster** comes with its battery disconnected to conserve battery life. To connect the battery, loosen four screws located on the top of the **Minimate Blaster**. Remove the face panel. Locate the battery connector. Attach the connector. Replace the face panel and tighten the four screws being careful not to over tighten or pinch wires.

WARNING: Do not pull on the internal wires or allow them to be pinched and damaged when assembling the monitor.

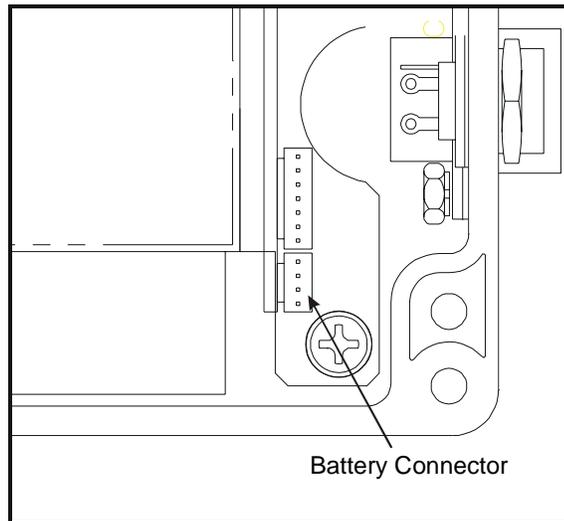


Figure 1 Connecting the Minimate Blaster Battery.

To disconnect the battery for shipping or storage purposes, reverse the above procedure.

Charge the Battery

Before you use the **Minimate Blaster**, charge its battery for at least 24 hours. Although Instantel ships every **Minimate Blaster** fully charged, it is a good idea to top up the battery charge before use. To check the battery charge, turn the **Minimate Blaster** on and read the battery level displayed in the Main Window.

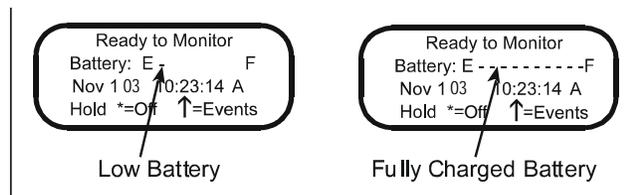


Figure 2 Battery Level Indicator.

To charge the battery, plug the AC adapter into the top connector located on the right-hand side of the **Minimate Blaster**. Plug the other end into a 120 VAC 60 Hz electrical outlet. The battery charging indicator light turns on. For electrical outlets other than 120 VAC 60 Hz, you must use an optional power converter. See your dealer for more information.



You can operate the **Minimate Blaster** during charging. Try the Basic Tutorial, Chapter 2, for a quick and easy lesson on how to record events.

WARNING: Always charge the monitor in a well ventilated area.

Do not allow the battery to become discharged and left in a discharged state for any extended period of time. Allowing the battery to become discharged may cause permanent damage to the battery.

Check the Monitor's Memory

The Start Up Window displays the amount of memory available. The bar line has ten bars with each representing ten percent of the total internal memory. When the memory is empty, you can record events. When the memory is full, the memory has stored the maximum number of events and cannot store more until you delete the stored events.

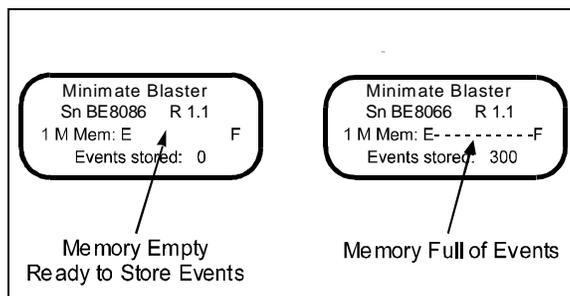


Figure 3 Memory Available Indicator.

Complete Your Registration Card or Register Online

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 warranty). You also receive free software upgrades for the **Minimate Blaster** and the **Blastware** software programs for the first year. All you have to do is complete the registration card included with your **Minimate Blaster** and return it to Instantel by mail or facsimile within thirty (30) days of purchasing your new monitor. Or, if you would like to register online, go to <http://www.instantel.com/service>, and submit a completed warranty form.

Handling Precautions

- **Handle All Components with Care.**
- **Keep the Minimate Blaster On Charge.**
Leaving the **Minimate Blaster** battery in a totally discharged state for an extended period of time irreparably damages the battery. Always charge the battery when fewer than two graph-bars appear in the display. A message appears on the display telling you to charge the monitor. When not in use, keep the **Minimate Blaster** on charge. The supplied Instantel charger protects the battery from overcharging.
- **Disconnect the Battery if Storing the Minimate Blaster.**
If storing for prolonged periods of time, make sure the battery is fully charged, then disconnect the battery. Recharge the battery every six months for twenty four hours.



- **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.
- **Use Only the InstanTel Supplied Cable to Connect the Minimate Blaster to a Personal Computer.**
Use the **Blastmate® III** PC connecting cable only, part number 712A2301. Using other cables including the **BlastMate II** to **MiniMate™** connecting cable, part number 715A0501, may damage your unit.
- **Never Connect or Disconnect Cables Without First Turning Off the Minimate Blaster and Your Computer.**
- **Do Not Drop the Minimate Blaster or Submerge it in Liquids.**
The **Minimate Blaster** is rugged and designed to withstand normal wear and tear. The **Minimate Blaster** is splash resistant designed to withstand temporary exposure to drops of water. It is not waterproof and should not be immersed in water. Immersing the monitor or installing the monitor where standing water may accumulate may damage the monitor.
- **Keep Computer Disks Away from the Minimate Blaster and Transducers.**
The **Minimate Blaster** external transducers contain magnets that could erase the data stored on computer disks.
- **Clean the Minimate Blaster Periodically.**
Vacuum dust, dirt, and sand from the **Minimate Blaster**. Use alcohol to remove stains. Do not use paint thinners and ketone solvents. These may damage the **Minimate Blaster**. To avoid scratching the protective cover and display, do not scrub the surfaces with abrasive material including cleaning pads.

Condensed Instructions

1. Set and level sensors and connect cables.
2. Turn on the unit by pressing *. Watch the display for battery, time and date.
3. Press SETUP to verify or edit setups. TEST to check sensor channels, or the UP ARROW key to access events.
4. Press START MONITOR to begin monitoring.
5. Depending on setup, the unit may perform a sensor test and “PERFORMING SENSORCHECK” is displayed on the LCD. Do not touch the sensors while this message is shown.
6. If accidentally triggered, press CANCEL and go back to Step 4.
7. When finished, turn off by pressing and holding *.

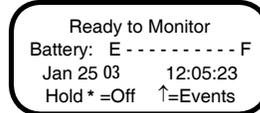
IMPORTANT: KEEP UNIT ON CHARGE WHEN NOT IN USE TO AVOID BATTERY DAMAGE.



Conventions Used throughout this Manual

The following typographical conventions appear throughout this manual.

- Bold type** This type indicates the **Minimate Blaster** keys you press. For example, when you see **Setups** key, it means press the **Setups** key located on the **Minimate Blaster** keyboard.
- Window** This word, when capitalized, refers to a message window appearing on the **Minimate Blaster** display. For example, when you see Main Window, it refers to the following display:





Notes:



1. INTRODUCTION

This manual is divided into sections. The first section is a tutorial for the new user. Follow this tutorial to record your first event quickly and easily. This section describes basic functions with illustrative examples to lead you through. The following section, called the Compliance Module, covers the operation of the monitor. The last sections provide reference and maintenance information, extensive troubleshooting support, followed by supporting information in the Appendix.

1.1. Minimate Blaster Features and Benefits

The **Minimate Blaster** offers outstanding features unequalled in the industry. The following table lists some of the features. Please see the specifications located in the Appendix of this manual for a complete list.

- Small, rugged package for portability and easy setup.
- Easy-to-use keypad with intuitive menu-driven operation.
- Rechargeable gel cell battery allows continuous monitoring for up to 210 hours.
- Non-volatile memory with storage capacity for up to 300 events.
- Sample rates from 1024 to 4096 samples per second.
- Integral monitor log records time and duration of monitoring jobs.
- **AutoRecord** stop mode allows the monitor to continue recording as long as activity cycles above the trigger level.
- Continuous monitoring means zero dead time, even while the unit is processing.



1.2. Accessories

Instantel's complete line of **Minimate Blaster** accessories offers you the control and flexibility to monitor all types of events. Sensors connect to the **Minimate Blaster** external models.

- **Transducer Leveling Plate** – with adjustable leveling feet and integrated bubble level. Used to mount the transducer to a wall or ceiling as well as ground installations.
- **Remote Alarm** – self contained remote alarm indicator complete with high power auxiliary drive capability for external sirens and other alarms.
- **DS 20 Wire Trigger** – a wire, broken by an explosion, transmits a signal to trigger the **Minimate Blaster** to start recording.
- **110 VAC and 220 VAC Adapter** – connect the **Minimate Blaster** to your local electrical power supply.
- **Auto / 12 V Adapter** – connect the **Minimate Blaster** to your vehicle's 12 volt power supply or a 12 volt battery for remote installations.
- **Extension Cable** – general purpose extension cable to connect transducers, microphones, and a personal computer. Available in standard and custom lengths.
- **Null Modem Cable** – for modem communication between the monitor and a modem (25 pin connection).
- **Optional Accessory Case** – carry **Minimate Blaster** and accessories in a hard case. Removable foam accommodates your accessories.



1.3. Minimate Blaster Keys



Main Window and On-line Help Information



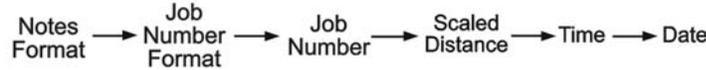
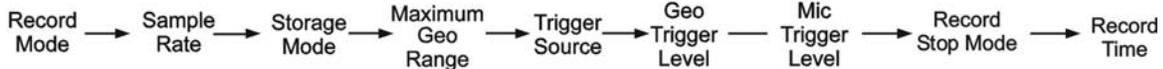
- turns monitor on or off.
- chooses menu options and saves choices.
- enter password to exit monitor mode.



- enters monitor mode.



- displays menus to setup the monitor for event recording including:



- moves you through event menu choices. Provides the following functions from the Main Window:



- performs Sensorcheck.



- returns to previous menu.



+ Test - Review Setups.



+ Enter - On-Line Help.



+ Up arrow - down arrow function.



+ Right arrow - left arrow function.



- moves through menu choices and moves the cursor.



+ Cancel - turn backlight on or off.



2. BASIC TUTORIAL

In this tutorial, you will learn how to turn on and setup the **Minimate Blaster** to record an event. Follow this tutorial to practice event monitoring. You can also use it as a guide when recording actual events.

Step 1: Install the Minimate Blaster

Unpack your **Minimate Blaster**. Attach the ground spikes to the standard transducer. Point the transducer in the direction of the event. For this tutorial, point it away from yourself. Press on the transducer to force the ground spikes fully into the ground. Check that the transducer is level. Attach the transducer cable to the GEO connector on the side of the **Minimate Blaster**. Screw the three sections of the microphone stand together and attach the microphone to the stand. Aim the front of the microphone towards the event. In our case, aim it away from yourself. Press the microphone stand into the ground keeping it in an upright position. Attach the microphone cable to the MIC connector located on the side of the **Minimate Blaster**.



Figure 1 Installing the Minimate Blaster.



Step 2: Turn the Minimate Blaster On

Press and hold the **Enter** key, located on the **Minimate Blaster** face panel, until you hear an audible beep. A Start Up Window displays for three seconds followed by the Main Window display. The Start Up Window shows the **Minimate Blaster** serial number, operating software release number, amount of installed memory, whether the memory is empty or full, and the number of events stored in the **Minimate Blaster**.

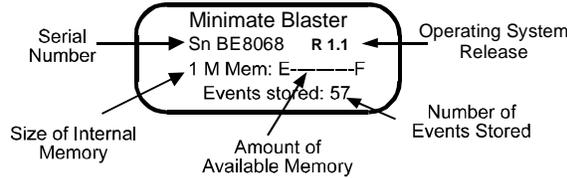


Figure 2 The Minimate Blaster Start Up Window.

The Main Window tells you the **Minimate Blaster** is ready to monitor. It also indicates battery level, date, time, and on-line help information. This is your starting window whenever you setup the **Minimate Blaster**. From here, you access all setups.

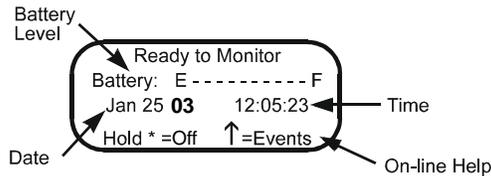


Figure 3 The Minimate Blaster Main Window.

Step 3: Check Your Installation

Check your installation by pressing the **Test** key. This executes the Sensorcheck program and tests the transducer and microphone. The message “Performing SensorCheck”, then “Check Channel(s):” with “Press Option + Test to Review Setups” appears on the display confirming that the installation is level.

Step 4: Review Setups

To review setups, press the **Option** key and the **Test** key together. The current setups scroll past on the **Minimate Blaster** display. You can pause the display by pressing the **Enter** key. To continue the scrolling, press the **Enter** key again.

Step 5: Change the Minimate Blaster Setups

After reviewing the setups, we have decided to change them, specifically the record mode, trigger source, trigger levels, record stop mode, the time, and the date. To change these setups, follow the steps below.

a) Change the Record Mode

The **Minimate Blaster** has two record modes: Continuous and Manual. In Continuous record mode, the **Minimate Blaster** records multiple events until you stop monitoring or the memory fills up with recorded events.

To change the record mode, press the **Setups** key with the Main Window displayed. The Recording Mode Window appears. Press the **Right Arrow** key to toggle between the two record



modes. When the “Recording Mode: Continuous” window appears, press the **Enter** key to select this record mode. The **Minimate Blaster** is now set to record in the continuous record mode.

b) Choose a Trigger Source

By choosing a trigger source, you set the **Minimate Blaster** to trigger and start recording on either ground vibrations, measured by the standard transducer, or sound pressure, measured by the microphone. The trigger source may be the transducer, microphone, or both the transducer and microphone.

To choose a trigger source, press the **Setups** key with the Main Window displayed. Use the **Enter** key to scroll through the windows until the Trigger Source Window appears. Press the **Right Arrow** key to scroll through the trigger sources until the Geo and/or Mic Window appears. Press the **Enter** key to select this trigger source.

c) Set the Trigger Levels

The **Minimate Blaster** uses a trigger level, chosen by you, to automatically start recording when an event’s activity exceeds this preset level. For our purposes, we will set an arbitrary trigger level for the transducer and the microphone.

To set the trigger level, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Geo Trigger Level Window appears. Set the Geo trigger level to 3.0 mm/s using the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the trigger level number. Press the **Enter** key to save your setting. The Mic Trigger Level Window appears. Set the Linear Mic trigger level to 100 dB using the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the trigger level numbers. Press the **Enter** key to save your setting.

d) Choose a Recording Stop Mode

The recording stop mode sets how the **Minimate Blaster** stops recording after being triggered. You can choose between a Fixed setting or an **AutoRecord™** setting. Selecting “Fixed” sets the record time to a specified length. In **AutoRecord**, unlike in Fixed, the **Minimate Blaster** continues to record event activity as long as that activity remains above the trigger level. We will set a fixed record time of two seconds.

To change the record time, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Recording Stop Mode Window appears. Use the **Up Arrow** key to choose the Fixed setting. Press the **Enter** key. The Record Time Window appears. Press the **Up Arrow** key to change the setting to two seconds. Press the **Enter** key to save this setting.

e) Set the Current Time

The **Minimate Blaster** supports the twelve hour, 11:55:23 PM, and twenty four hour, 23:55:23, time formats. You can choose either format.

To set the time, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Time: Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to set the present time. To select either the 12 or 24 hour time format, position the cursor under the AM/PM/24 hour indicator. Press the **Up Arrow** key to display the required setting. Press the **Enter** key to save your setting.

f) Set Today’s Date

The **Minimate Blaster** uses the Month/Day/Year date format.



To set the date, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Date Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to set the date. Press the **Enter** key to save your setting.

Step 6: Record Events

At this point, you are ready to record events. Press the **Start Monitor** key to begin monitoring. To see an event being recorded, clap your hands once in front of the microphone. The **Minimate Blaster** beeps indicating an event activity has exceeded the trigger level and the event's results appear on the **Minimate Blaster** display. The **Minimate Blaster** then returns to the monitoring mode ready to record another event. Now bump the **Minimate Blaster** standard transducer. Again, the **Minimate Blaster** beeps. The results appear on the display and the **Minimate Blaster** returns to the monitoring mode. Press the **Cancel** key to stop monitoring.

We have just recorded two events and stored them in the **Minimate Blaster** memory. In the next step, we view these events.

Step 7: View the Events

Let us view the events we just recorded. From the Main Window, press the **Up Arrow** key to display the View Events Window. Press the **Enter** key to view the most recently recorded event. In our tutorial, this is the one we triggered by bumping the transducer. Next, press the **Up Arrow** key to display the event we recorded caused by clapping our hands in front of the microphone.

Step 8: Turn the Minimate Blaster OFF

We are finished with the **Minimate Blaster**, so we can turn it off. Press the **Cancel** key to return to the Main Window. Press and hold the **Enter** key until the display disappears. The **Minimate Blaster** is now turned off.

Congratulations, you are now a Minimate Blaster User.



3. THE MINIMATE BLASTER

This chapter provides instructions to install and setup the **Minimate Blaster**.

3.1. Explanation of Sensor Orientation

The sensor measures transverse, vertical, and longitudinal ground vibrations in terms of particle velocity. Transverse ground vibrations agitate particles in a side to side motion. Vertical ground vibrations agitate particles in an up and down motion. Longitudinal ground vibrations agitate particles in a back and forth motion progressing outward from the event site. Events also affect air over pressure by creating what is commonly referred to as “air blast”. By measuring air pressure, we can determine the effect of air blast energy on structures.

Orienting the microphone, or pointing the arrow on the standard transducer, towards the blast ensures the proper reading in all channels.

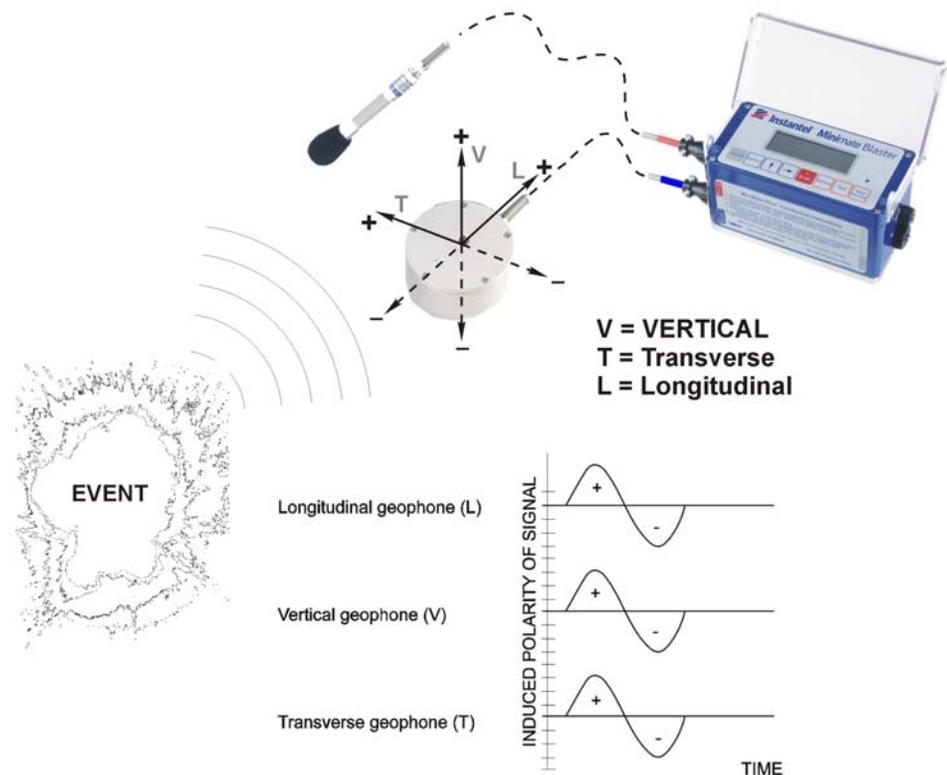


Figure 4 Sensor Orientation

3.2. Installing the Standard Transducer

The following sections apply to the standard transducer as supplied by InstanTel. 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. Whatever the method, it is important for you to couple the transducer securely to ensure reliable monitoring results.

The following sections provide example installation methods. For wall and ceiling installations, refer to the Reference chapter. Other methods may be used if they satisfy the following requirements.



1. Arrow Pointed in Direction of the Event

The arrow on the top of the standard transducer must be pointed in the direction of the event to ensure the geophone sensors, located inside standard transducer, remain in their natural axis.

2. Level Installation

The standard transducer must be installed level. For the installations on a rigid surface, a leveling plate is available with three leveling feet and an integrated bubble level indicator.

3. Securely Coupled to the Surrounding Surface

The standard transducer must be securely coupled to the surrounding surface. The surface must be compact with no loose or soft material close to the standard transducer. Coupling is critical for reliable and accurate monitoring results. Insufficient coupling allows the standard transducer to move independently of the surrounding surface resulting in distorted, often higher, monitoring results.

Coupling methods depend upon the type of surface with no single method applicable to all types. It is up to you to check the surface and mount the standard transducer with sufficient coupling to ensure reliable monitoring results.

4. Protect the Minimate Blaster from Water

The **Minimate Blaster** is splash resistant designed to withstand temporary exposure to drops of water. It is not waterproof and should not be immersed in water. Immersing the monitor or installing the monitor where standing water can accumulate may damage the monitor.

3.2.1. Soft Surface Installation

Always install and use the ground spikes provided with the standard transducer. For the best coupling, bury the standard transducer, or cover with a sandbag.

a. Using the Ground Spikes

Screw the three ground spikes into the bottom of the standard transducer and tighten. Aim the standard transducer in the direction of the event. Press on the top of the standard transducer to push the spikes fully into the ground. Check the standard transducer to ensure it is securely in place and level. Press the **Test** key to check your sensors using Sensorcheck.

WARNING: Do not over-tighten the ground spikes. This can damage the casing of the standard transducer.



Figure 5 Installing the Standard Transducer using the Ground Spikes.



Figure 6 Final Installation with Ground Spikes Pushed Fully into the Ground.



b. Burying the Standard Transducer

You can bury the standard transducer to couple it to the ground and prevent movement.

The ground must be hard and compact with no loose material surrounding the standard transducer and the compact ground material. Dig a hole from four inches (10 cm) to six inches (15 cm) deep. Place standard transducer in the hole with the arrow pointing toward the event. Level the standard transducer. Compact the material around the standard transducer while back filling to securely couple it to the surrounding ground material.

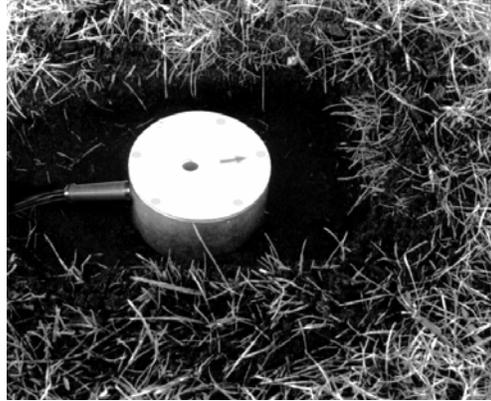


Figure 7 Burying the Standard Transducer.



Figure 8 Fill in and pack the material around the Standard Transducer.

3.2.2. Hard Surface Installation

For hard surface installations, such as rock or concrete, the preferred installation method bolts standard transducer to the surface. A second method, for very low level velocities only, uses a sandbag placed over the standard transducer.

a. Bolting the Standard Transducer

A standard transducer may be bolted to a surface alone or with the aid of the optional leveling plate. Position the standard transducer with leveling plate, if attached, on the surface and mark the position of the bolt. Use a 3/8 inch (9.5 mm) bolt or threaded rod. Install the bolt according to the manufacturer's instructions. Slide the standard transducer, and leveling plate, over the bolt. Slide a 3/8 inch (9.5 mm) washer and a 3/8 inch (9.5 mm) lock washer over the bolt. If using the leveling plate, level the standard transducer using the leveling feet and integrated bubble level. Tighten the retaining nut to finish the installation. Press the **Test** key to check your sensors using Sensorcheck.



Figure 9 Bolting the Standard Transducer to a surface.



Figure 10 Bolting the Standard Transducer to a surface using the Leveling Plate.



b. Sandbagging – For Very Low Velocity Levels Only

Use this method for installations where velocity levels remain very low. The sandbag must be of sufficient size to cover the standard transducer and lay on the surrounding surface around the standard transducer. A sandbag should weigh at least 25 pounds (12 kg) containing sand or 1/4" washed gravel or equivalent. The optional fastening plate or leveling plate can be used with this method.

3.3. Installing the Microphone

Instantel microphones come with a sectional three foot (one meter) mounting stand. Screw the three mounting stand pieces together. Locate the mounting stand at the point of interest. Press the stand into the ground. Check that the stand is firmly positioned and installed upright. Insert the microphone into the mounting bracket on the top of the stand, and attach the windscreen to reduce false triggering caused by wind. Point the microphone in the direction of the event. Connect the microphone cable to the **Minimate Blaster**. Press the **Test** key to check your microphone and the microphone connection.

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.

3.4. The Minimate Blaster Keyboard

The integrated keyboard offers convenient access to all the **Minimate Blaster** operations. The keyboard has eight keys with additional functions accessed by pressing two keys at the same time. The **Minimate Blaster** provides a confirmation beep when a key is pressed. Refer to the keyboard diagram located in Chapter 1.

3.5. Enter * Key

The Enter * key turns the **Minimate Blaster** on or off. It also scrolls through the **Minimate Blaster** windows, selects windows, and saves your settings.

To turn the **Minimate Blaster** ON, press and hold the **Enter** key until an audible beep sounds. To turn the **Minimate Blaster** OFF, display the Main Window then press and hold the **Enter** key until the display disappears. When turning on the **Minimate Blaster**, you can display the Main Window immediately by pressing the **Cancel** key after pressing the **Enter** key. The key also lets you view previously recorded events while the monitor is in the monitor mode waiting for a trigger.

To view events while monitoring, press the **Enter** key. Data for the most recently recorded event appears on the display. Press the **Up Arrow** key to display other events. Press the **Right Arrow** key to display event data for other channels. Press and hold the key until you hear a beep confirming your key press. If you viewed event data before, the data last displayed appears first the next time you view events.

Event data appears in the following order:

1. Peak Particle Velocity (PPV) and Air Overpressure.
2. Velocity results for all channels, displayed in pairs, beginning with channels 1 and 2.
3. Acceleration and peak displacement results for each channel displayed individually.
4. PVS



5. PPV in dB

3.6. Start Monitor Key

Press this key to enter monitor mode. The **Minimate Blaster** is now waiting to record an event.

In manual record mode, the unit will display the following message when you press the Start Monitor key: “Press ‘*’ to start, Cancel to abort.” Press the **Enter** key to begin monitoring.

You can view previously recorded events while the monitor is in the monitor mode (refer to Section 3.5 for more information on using the “Enter - *” key).

3.7. Setups Key

The setups configure the **Minimate Blaster** to record events. The functions accessed by this may change from one monitoring session to another. You can change the **Minimate Blaster** setups using the keyboard or using a personal computer running the **Blastware** software. This section outlines the procedures to change the setups using the **Minimate Blaster** keyboard. For information on how to change the setups using a personal computer, refer to the **Blastware** Operator Manual.

3.7.1. Record Mode

A record mode determines how the **Minimate Blaster** records events. The **Minimate Blaster** offers the following recording modes:

a. Continuous Record Mode

Use continuous record mode to record multiple events automatically. The **Minimate Blaster** records an event, displays the results, and continues to monitor, ready to record following events. The **Minimate Blaster** records all events whose activity exceeds a preset trigger level. See below for information on the trigger level.

b. Manual Record Mode

Use manual record mode 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.

3.7.2. Sample Rate

The **Minimate Blaster** offers three sample rates: a standard rate of 1024 samples per second, a fast rate of 2048 samples per second, and a faster rate of 4096 samples per second. Increasing the sample rate increases the accuracy of the waveform recording. For this reason, set the sampling rate according to the location of the standard transducer. For close-in monitoring, set the sample rate to 4096 samples per second. For far-field monitoring, set the sample rate to 1024 samples per second.

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 before they can appear at lower frequencies. The **Minimate Blaster** standard sensors have anti-alias sensors built into them to avoid this problem.

To choose a sample rate, press the **Setups** key with the Main Window displayed. Use the **Enter** key to scroll through the windows until the Sample Rate Window appears. Press the **Right Arrow** key to scroll through the available sample rates. Press the **Enter** key to select a sample rate when it appears on the display.



3.7.3. Storage Mode

The storage mode setting allows you to set the amount of data recorded with each event. In the Store Full Waveform setting, the **Minimate Blaster** records all event data. In Store Summary Only mode, the monitor records all event data **except** the graphical waveforms and the Compliance frequency standard.

WARNING: If you choose Store Summary Only, you will not be able to re-create the waveform.

To choose a storage mode, press the **Setups** key with the Main Window displayed. Use the **Enter** key to scroll through the windows until the Storage Mode Window appears. Press the **Right Arrow** key to scroll through the available settings, either Store Full Waveform or Store Summary Only. Press the **Enter** key to choose a mode when it appears on the display.

3.7.4. Maximum Geo Range

The Maximum Geo Range specifies the measurement limits of the geophones in the **Minimate Blaster** or standard transducer. Two ranges are available: 1.25 in/s (31.7 mm/s) and 10.0 in/s (254 mm/s). Choosing a maximum geophone range depends on the proximity of the transducer to the event and the expected velocities.

To choose a maximum geophone range, press the **Setups** key with the Main Window displayed. Use the **Enter** key to scroll through the windows until the Maximum Geo Range Window appears. Press the **Right Arrow** key to scroll through the two settings, either 1.25 in/s (31.7 mm/s) and 10.0 in/s (254 mm/s). Press the **Enter** key to choose a range when it appears on the display.

3.7.5. Trigger Source

Choose a trigger source when using Continuous Record Mode. The trigger source sets the **Minimate Blaster** to trigger and start recording an event automatically on ground vibrations, measured by a transducer, or air overpressure, measured by a microphone. The **Minimate Blaster** has three trigger source settings: transducer alone, microphone alone, or both transducer and microphone together. When you choose both transducer and microphone together, triggering occurs and recording begins if an event's ground vibrations or air overpressure exceeds the trigger level for either the transducer or the microphone.

To choose a trigger source, press the **Setups** key with the Main Window displayed. Use the **Enter** key to scroll through the windows until the Trigger Source Window appears. Press the **Right Arrow** key to scroll through the three trigger sources. Press the **Enter** key to select a trigger source when it appears on the display.

3.7.6. Trigger Level

The trigger level sets a threshold that must be exceeded by an event activity before the **Minimate Blaster** begins recording. Set a trigger level for the trigger source or sources chosen above.

Use your judgment when setting the trigger level. You must set the level high enough so the **Minimate Blaster** 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 event activity exceeds the trigger level and starts the **Minimate Blaster** recording. Available trigger level ranges appear in the specifications located in the Appendix of this manual.

To set the trigger level, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to display the Trigger Level Window for the trigger source chosen above. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the trigger level number. Press the **Enter** key to save your setting. If both the geophone and microphone were chosen as trigger sources, pressing the **Enter** key saves the geophone trigger level setting and then displays



the Mic Trigger Level Window. Set the microphone trigger level and press the **Enter** key to save your setting.

3.7.7. Record Stop Mode

The record stop mode sets how the **Minimate Blaster** stops recording after being triggered. You can choose between a **Fixed** setting or an **AutoRecord** setting. **Fixed** sets the record time to a specified length. For example, you set the **Minimate Blaster** to record for two seconds in the Basic Tutorial. Once the record time has elapsed, the **Minimate Blaster** stops recording. In **AutoRecord**, unlike in **Fixed**, the **Minimate Blaster** 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 a specified period of time after the event activity falls below the trigger level. The period of time, called the Auto Window, can be adjusted. See page 3–16.

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 **Minimate Blaster** memory.

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 **Minimate Blaster** 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 the event's activity, set the record time to 2.0 seconds. There is no single method for setting a record time. Use your knowledge and experience to determine a record time.

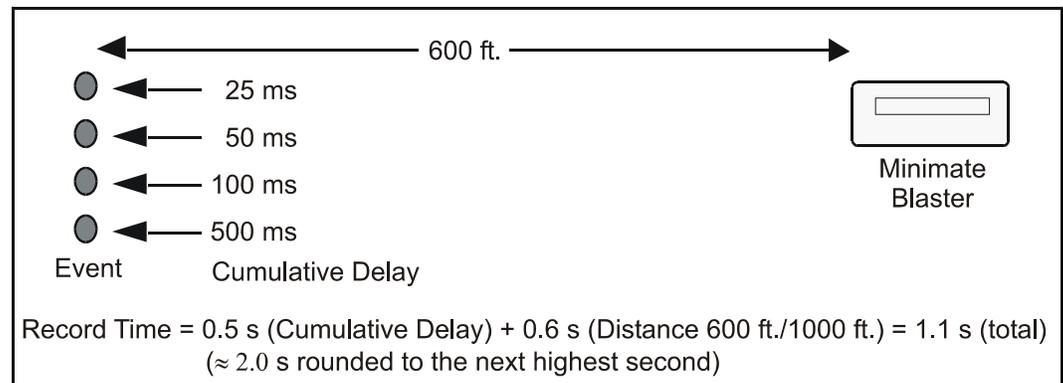


Figure 11 Calculating a Recording Time.

The total record time available depends upon the amount of available memory. The **Minimate Blaster** 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.

To set the record stop mode, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Record Stop Mode Window appears. Press the **Up Arrow** key to display either the **Fixed** setting or the **AutoRecord** setting. Press the **Enter** key to save your setting when it appears in the display.

3.7.8. Record Time

The Record Time sets the length of time in seconds that the unit records if you have selected a **Fixed** record stop mode. Once the record time has elapsed, the monitor stops recording. The maximum record time is displayed by the unit.

3.7.9. Notes Format

The notes format lets you include notes describing an event. You write the notes using the **Blastware** software and then copy them to the **Minimate Blaster**. Press the **Option** and **Test**



keys together to review setups and see if notes are presently stored in the **Minimate Blaster** and what these notes are.

To set the notes format, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Notes Format Window appears. Use the **Right Arrow** key to display the two settings. The Use Notes setting records your notes with an event. If you choose the Use Blank Text Notes choice, only blank text lines record with an event leaving you space to manually write in notes after you have printed the event.

3.7.10. Job Number Format

You may include a job number for each recorded event. Job numbers help you keep track of events stored in the **Minimate Blaster** or in a computer. Job numbers range from 1 to 9999.

To display the Job Number Format Window, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Job Number Format Window appears. Press the **Right Arrow** key to display the two choices: Use Job Number or Don't Use Job Number. Press the **Enter** key to select a setting when it appears on the display.

If you chose the Use Job Number setting, after pressing the **Enter** key the Job Number Window appears. Press the **Right Arrow** key to position the cursor and the **Up Arrow** key to edit the four digit job number to the desired number. Press the **Enter** key to save the job number.

3.7.11. Scaled Distance

Scaled distance information can be saved with each event. The scaled distance information includes two factors: distance from blast and 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.

To enter scaled distance information, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Scaled Distance: Window appears. Press the **Up Arrow** key to display the Use Scaled Distance Window. Press the **Enter** key. The Distance from blast Window appears. Use the **Arrow** keys to enter the distance from the blast to the monitor's sensors then press the **Enter** key. The Charge weight Window appears. Use the **Arrow** keys to enter the charge weight and press the **Enter** key to save your setting.

If you do not require the scaled distance information, choose the Omit Scaled Distance choice from the Scaled Distance Window.

3.7.12. Time

The **Minimate Blaster** supports the twelve hour, 11:55:23 PM, and twenty four hour, 23:55:23, time formats. You can choose either format.

To set the time, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Time: Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to set the time. To select 12 or 24 hour time formats, position the cursor under the AM/PM/24 hour indicator. Press the **Up Arrow** key to display the required setting. Press the **Enter** key to save your setting.

a. Adjust Clock Speed (Option Key + Setups Key)

Pressing the **Option** key and the **Setups** key at the same time from within the Time: Window accesses the Clock Speed Adjust Window. This command allows you to make adjustments to the speed of the **Minimate Blaster**'s internal clock.

Enter the number of seconds that the clock will be adjusted each day. Use the **Up Arrow** key to first select positive or negative, and then enter the number of seconds using the **Up and Right**



Arrow keys. Positive numbers are added to the time and negative numbers are subtracted. Press the **Enter** key to save your setting. You will return to the Time Window.

Note: The Daily Self Check function must be activated in order for the time to be corrected. The time is adjusted as part of the Daily Self Check. Please see page 3–10 for information on how to activate the Daily Self Check.

3.7.13. Date

The **Minimate Blaster** supports the Month/Day/Year date format.

To set the date, press the **Setups** key when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Date Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to set the date. Press the **Enter** key to save your setting.

3.8. Right Arrow Key + Setups Key

Pressing the **Right Arrow** key and the **Setups** key at the same time provides the following functions: timer mode, daily self check, Sensorcheck, measurement system, basic channels, microphone units, geophone alarm level, microphone alarm level, serial connection, beep when triggered, use GPS location, and baud rate.

3.8.1. Timer Mode

The timer function sets the **Minimate Blaster** to automatically turn on and commence monitoring operations at a preset time in the future. The timer can be set for a one time monitoring session or it can be set to monitor at the same time every day. Using the timer extends the **Minimate Blaster** battery life by turning on and monitoring only the time periods when events occur and not the time periods between events. It also minimizes the recording of false events from other sources.

To stop timer recording, press the **Cancel** key at any time.

a. Monitor Once Only

To set the **Minimate Blaster** to monitor at some time in the future, press the **Right Arrow** key and the **Setups** key together when the Main Window is displayed. The Timer Mode Window appears. Press the **Right Arrow** key to display the Monitor Once Only option. Turn the timer on by pressing the **Enter** key. The Monitor Start Time Window appears. Enter the start time for monitoring operations to begin. Use the **Right Arrow** key to move through the date and time displays and the **Up Arrow** key to change the settings. Press the **Enter** key to save the Monitor Start Time setting and display the Monitor Stop Time Window. Enter the stop time for monitoring operations to end. Use the **Right Arrow** key to move through the date and time displays and the **Up Arrow** key to change the settings. Press the **Enter** key to save the stop time setting. Press the **Start Monitor** key to enter the timer mode. The timer is now set to start monitoring operations automatically according to your start and stop dates and times. The monitor displays the following window:

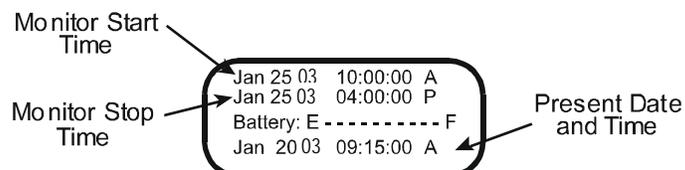


Figure 12 Timer Mode Window – Monitor Once Only.

b. Monitor Everyday

To set the **Minimate Blaster** to monitor at the same time each day, press the **Right Arrow** key and the **Setups** key together when the Main Window is displayed. The Timer Mode Window



appears. Press the **Right Arrow** key to display the Monitor Everyday option. Press the **Enter** key to display the Daily Start Time Window. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the hour and minute settings. Press the **Enter** key to save your start time. The Daily Stop Time Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the daily stop time. Press the **Enter** key to save your changes. Press the **Start Monitor** key to enter the timer mode. The **Minimate Blaster** is now set to start and stop monitoring operations automatically at the same time every day. The monitor displays the following window:

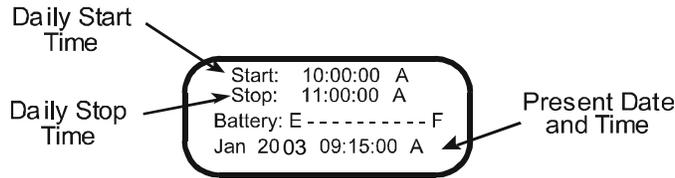


Figure 13 Timer Mode Window – Monitor Everyday.

3.8.2. Daily Self Check

Use the Self Check mode for remote monitoring where you require a record indicating the monitor was operating properly over a period of time.

Daily Self Check must be enabled for adjustment of the unit’s real-time clock speed. The Self Check mode program operates when the monitor is in the monitor mode; the monitor temporarily exits the monitor mode, at the same time each day specified by you, performs the check, and returns to monitor mode. The results appear in a monitor log entry.

To select the self check mode, use the **Right Arrow** key and simultaneously press the **Setups** key, then press **Enter** to except the Timer Mode setting: Daily Self Check mode is now available – use the **Up Arrow** or **Right Arrow** to toggle between Enabled and Disabled options, and **Enter** to save the desired setting. If you select Enabled, the next screen prompts for a time to be entered. Use the **Right Arrow** to move the cursor between hours and minutes, and the **Up Arrow** to change the time, then press **Enter** to save your changes.

3.8.3. Sensorcheck

The Sensorcheck Window allows you to choose when the Sensorcheck program runs automatically to test the **Minimate Blaster** and its transducer and microphone sensors. You can run Sensorcheck manually by pressing the **Test** key. You can choose not to run Sensorcheck, to run Sensorcheck after recording each event, or only once before monitoring starts. If you choose Disabled, Sensorcheck does not run and the sensors are not checked. If you choose After Each Event, Sensorcheck runs after recording each event. If you choose Before Monitoring Starts, Sensorcheck runs once before monitoring starts, when you enter the monitor mode. The results of this single Sensorcheck appear with each event recorded during the monitoring session. This reduces processing time, by not having to run Sensorcheck for each event, and speeds up recording especially when using the continuous record mode.

To set when to run Sensorcheck, press the **Right Arrow** key and the **Setups** key at the same time when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Sensorcheck Window appears. Press the **Right Arrow** key to display the Disabled, Before Monitoring, or After Each Event choices. Press the **Enter** key to select a setting when it appears on the display.

3.8.4. Measurement System

The **Minimate Blaster** uses the Metric or the Imperial measurement system.



To set the **Minimate Blaster** to operate with either system, press the **Right Arrow** key and the **Setups** key at the same time when the Main Window is displayed. Press the **Enter** key to scroll through the windows until the Measurement System Window appears. Press the **Right Arrow** key to display the Metric or Imperial settings. Press the **Enter** key to select a setting when it appears on the display.

3.8.5. Basic Channels

You can operate **Minimate Blaster** monitors with all recording channels on or you can turn off either the geophone or microphone recording channels

You may, for example, turn off the microphone if you are monitoring inside a building where the microphone is not applicable. This reduces the amount of memory required to save and store a single event and therefore increases the overall number of events the **Minimate Blaster** can record and store.

To display the Basic Channels Window, press the **Right Arrow** key and the **Setups** key together. Press the **Enter** key to scroll the windows until the Basic Channels Window appears. Choose All Channels ON to enable both the geophone and the microphone.

3.8.6. Microphone Units

The measurement units used on the microphone channel depend on the microphone type and measurement system (metric [pa], or imperial [psi], or decibels [d]) being used. For Linear “L” microphones, you have the choice between psi (L), dB (L), or pa. (L).

To choose the microphone measurement units, press the **Right Arrow** key and the **Setups** key together. Press the **Enter** key to scroll the windows until the Microphone Units Window appears. Press **Right Arrow** key repeatedly to display the three choices. Press the **Enter** key to select a measurement unit when it appears on the display.

3.8.7. Geo Alarm Level

The Geo Alarm Level controls the triggering of an optional remote alarm (711A1401).

The remote alarm sounds two alarms: warning and alarm. The warning alarm sounds when event activity exceeds the geophone trigger level. The Geo Alarm Level can be set to a higher level than the geophone trigger level. This allows for the triggering of a second alarm at the higher level.

To set the Geo Alarm Level, press the **Right Arrow** key and the **Setups** key together. Press the **Enter** key repeatedly to scroll through the windows until the Geo Alarm Level Window appears. Use the **Up** and **Right Arrow** keys to set the alarm level. Press the **Enter** key to save your setting.

3.8.8. Mic Alarm Level

The Mic Alarm Level controls the triggering of an optional remote alarm (711A1401).

The remote alarm sounds two alarms: warning and alarm. The warning alarm sounds when event activity exceeds the microphone trigger level. The Mic Alarm Level can be set to a higher level than the microphone trigger level. This allows for the triggering of a second alarm at a higher level.

To set the Mic Alarm Level, press the **Right Arrow** key and the **Setups** key together. Press the **Enter** key repeatedly to scroll through the windows until the Mic Alarm Level Window appears. Use the **Up** and **Right Arrow** keys to set the alarm level. Press the **Enter** key to save your setting.

3.8.9. Serial Connection

This sets the **Minimate Blaster** to communicate with a computer using the BlastMate III PC Connecting Cable (712A2301) or via a modem over telephone lines or radio frequencies. You



must set the **Minimate Blaster** to the proper serial connection before starting communications. To communicate with a computer using the connecting cable, choose the Direct setting. To communicate using modems, choose the Via Modem setting. Set the baud rate on the monitor to match the baud rate of your computer or modem.

To choose the serial connection, press the **Right Arrow** key and the **Setups** key together. Press the **Enter** key to scroll the windows until the Serial Connection Window appears. Press **Right Arrow** key repeatedly to display the two choices. Select Direct if you are connecting to a computer with the BlastMate cable or Via Modem if you are using modems. Press the **Enter** key to select a choice when it appears on the display.

3.8.10. Direct Baud Rate or Modem Baud Rate

This sets the baud rate for the serial connection method chosen in the previous step, either direct or via modem. For direct, choose a baud rate of 38400. For modem communications, choose a baud rate supported by the modems you are using.

3.8.11. Beep When Triggered

This menu allows you to select whether or not the unit will emit a beep when triggered. Select On to activate beeps, and Off to turn them off.

To set Beep When Triggered, press the **Right Arrow** key and the **Setups** key together. Press the **Enter** key to scroll the windows until the Beep When Triggered Window appears. Press the **Right Arrow** key to toggle between On and Off. Press the **Enter** key to select a choice when it appears on the display.

3.9. Up Arrow Key

The **Up Arrow** key moves you through the **Minimate Blaster** windows and edits numerical values within windows. Also, from the Main Window, the **Up Arrow** key scrolls through the following functions.

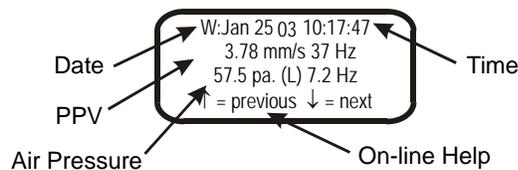
3.9.1. View Events

You can view events stored in the **Minimate Blaster** internal memory.

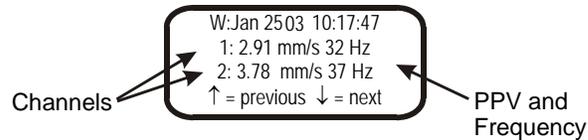
From the Main Window, press the **Up Arrow** key to display the View Events Window. This window indicates the total number of events stored in the **Minimate Blaster**. Press the **Enter** key to enter the View Window. Press the **Up Arrow** key to scroll through the events beginning with the most recently recorded event. Press the **Right Arrow** key to scroll through the data for the selected event. You can also view events on the display while the monitor is in monitor mode, waiting for a trigger. See the section explaining the **Enter** key, above.

By default, event data appears in the following order. If you viewed event data before, the data last displayed when you stopped viewing events appears first the next time you view events.

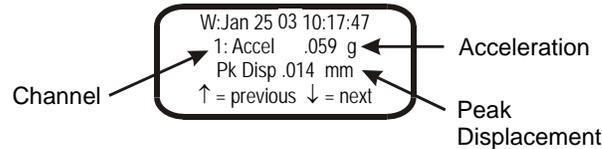
1. Peak Particle Velocity (PPV) and Air Pressure.



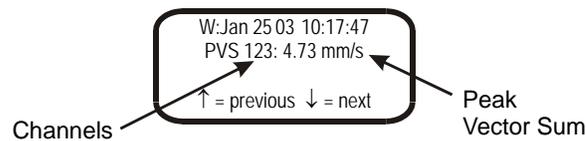
2. Velocity or air pressure results along with the frequency for all channels, displayed in pairs, beginning with channels 1 and 2. For advanced events, the velocity result appears only. Frequency is not calculated for advanced events.



3. Acceleration and peak displacement results for each channel displayed individually.



4. Peak vector sum results for channels 1, 2, 3.



5. PPV for all enabled channels expressed in decibels, and Air Pressure. (Units with a serial number of 6000 or higher only.)

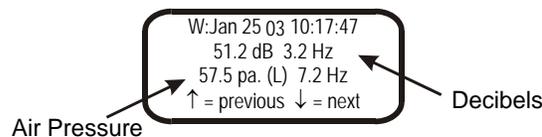


Figure 14 The View Event Window.

3.9.2. Delete All Events

Deleting all the events stored in the **Minimate Blaster** frees up internal memory space in order to record additional events.

WARNING: Once the events have been deleted, they cannot be recovered.

To delete all the events in the **Minimate Blaster**, press the **Up Arrow** key with the Main Window displayed, until the Delete All Events Window appears. This window indicates the total number of events stored in the **Minimate Blaster**. Press the **Enter** key to begin the deletion. A second window appears asking you to hold the **Enter** key for five seconds to delete all files. This window asks you to confirm your initial choice or leave the window without continuing. Press and hold the **Enter** key for five seconds to delete all events. At the bottom of the window, a countdown indicator tells you the number of memory blocks being deleted. The message “All Memory Erased. Press any key.” indicates all events have been successfully deleted from the monitor.

3.9.3. Print Event List

You can print an event list indicating all the events stored in the **Minimate Blaster** along with each event’s date, time, and recording results. A printer (optional) must be connected to the **Minimate Blaster**. See the Appendix for information on how to connect a printer to the **Minimate Blaster**.

To print an event list, press the **Up Arrow** key when the Main Window is displayed, until the Print Event List Window appears. Press the **Enter** key to print the event list.



3.9.4. Print Selected Event

You can select and print specific events stored in the **Minimate Blaster**. A printer (optional) must be connected to the **Minimate Blaster**. See the Appendix for information on how to connect a printer to the **Minimate Blaster**.

To print one event, press the **Up Arrow** key when the Main Window is displayed, until the Print Selected Event Window appears. Press the **Enter** key to display the most recently recorded event. Press the **Up** or **Right Arrow** keys to scroll through the other events stored in the **Minimate Blaster**. To print an event, press the **Enter** key when it appears on the display. During printing, the event appears on the display along with the message “Printing Event”. When printing finishes, the display returns to the Event Window where you can scroll through the stored events and choose another event to print, if desired.

3.9.5. Print All Events

You can print an event summary report for each event stored in the **Minimate Blaster**. A printer (optional) must be connected to the **Minimate Blaster**. See the Appendix for information on how to connect a printer to the **Minimate Blaster**.

To print all the events, press the **Up Arrow** key when the Main Window is displayed, until the Print All Events Window appears. Press the **Enter** key to select this choice and begin printing. During printing, the **Minimate Blaster** displays each event along with the total number of events to be printed. The display returns to the Print All Events Window after printing finishes.

3.9.6. Upload One Event

You can copy events stored in a **Minimate Blaster** to a BlastMate III monitor. For example, you could transfer events from the **Minimate Blaster** to the BlastMate III then print them using the BlastMate III printer. **Minimate Blaster** events printed on a BlastMate III are identified as **Minimate Blaster** events on the top of the event summary report.

In order to upload events, you must first connect the **Minimate Blaster** to the BlastMate III Cable (716A1801 optional). Plug the BlastMate III end of the cable into the BlastMate III Aux connector and the **Minimate Blaster** end of the cable into the **Minimate Blaster** Aux connector. Check that the BlastMate III is displaying the Main Window with the message “Ready to Monitor.” Set the Serial Connection to Direct and set the baud rate to the same rate in both monitors.

To upload one event, press the **Up Arrow** key when the Main Window is displayed, until the Upload One Event Window appears. Press the **Enter** key to select this choice. The most recently recorded event appears on the display. Press the **Up Arrow** to display the next event or the **Right Arrow** to display the earliest recorded event. With the required event appearing on the **Minimate Blaster** display, press the **Enter** key to begin the uploading. The message “Uploading” along with the number of the event appears on the bottom of the **Minimate Blaster** display. After the event has been transferred to the BlastMate III, the message “Event Uploaded Successfully” appears momentarily on the **Minimate Blaster** display.

3.9.7. Upload All Events

You can copy all the events stored in a **Minimate Blaster** to a BlastMate III monitor. For example, you could transfer events from the **Minimate Blaster** to the BlastMate III then print them using the BlastMate III printer. **Minimate Blaster** events printed on a BlastMate III are identified as **Minimate Blaster** events on the top of the event summary report.

In order to upload events, you must first connect the **Minimate Blaster** to the BlastMate III Cable (716A1801 optional). Plug the BlastMate III end of the cable into the BlastMate III Aux connector and the **Minimate Blaster** end of the cable into the **Minimate Blaster** Aux connector.



Check that the BlastMate III is displaying the Main Window with the message “Ready to Monitor.” Set the Serial Connection to Direct and set the baud rate to the same rate in both monitors.

To upload all the events, press the **Up Arrow** key when the Main Window is displayed, until the Upload All Events Window appears. Press the **Enter** key to select this choice. The message “Uploading” along with the number of each event currently being uploaded appears on the bottom of the **Minimate Blaster** display. After all the events have been transferred to the BlastMate III, the message “All Events Uploaded Successfully” appears momentarily on the **Minimate Blaster** display.

3.9.8. Copy BMIII Notes

This command copies the notes from a **BlastMate III** to a **Minimate Blaster**. You require the **Minimate Plus** to the **BlastMate III** Cable (716A1801 optional).

Plug the **BlastMate III** end of the cable into the BlastMate III Aux connector and the **Minimate Blaster** end of the cable into the **Minimate Blaster** Aux connector. Check that the BlastMate III is displaying the Main Window with the message “Ready to Monitor.” Set the Serial Connection to Direct and set the baud rate to the same rate in both monitors.

To copy the notes, press the **Up Arrow** key repeatedly on the **Minimate Blaster** until the Copy BMIII Notes window appears. Press the **Enter** key. The message “Copying” appears on the display followed by “Notes Copied Successfully” when the process completes.

3.10. Cancel Key

Use this key to return to the previous window. It can be pressed at any time during operations. Pressing the key a number of times always returns you to the Main Window. You can change a setting and return to the Main Window without scrolling through further windows.

Also, the **Cancel** key exits all monitoring modes. You may be requested to enter a password before exiting monitoring. Press the **Cancel** key. The Password Window appears. You have ten seconds to enter the four character password. Enter the four character password then press the **Enter** key. This password protection can be enabled or disabled by pressing the **Option** key + **Setups** key and choosing the Password command. See page 3–16.

3.11. Test Key

Pressing the **Test** key executes Sensorcheck and tests the **Minimate Blaster** and its sensors. Sensorcheck performs a two stage test. In the first stage, the program displays the **Minimate Blaster** serial number, software version, the total amount of memory installed, the amount of memory available to store events, and the number of events presently stored in memory.

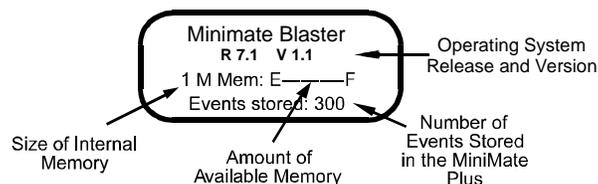


Figure 15 The Sensorcheck Window.

The second stage tests each geophone within the standard transducer and the microphone. The program also tests the operation of the **Minimate Blaster** itself and the transducer and microphone connecting cables. The message “All Channels Working. Press Option + Test to Review Setups” indicates the **Minimate Blaster** passed the Sensorcheck.



3.12. Option Key

The **Option** key, when used in combination with other keys, provides the following functions.

3.12.1. Option Key + Setups Key

Pressing the **Option** key and the **Setups** key at the same time accesses additional functions including Reset Factory Defaults, Auto Window, Password, Auxiliary Trigger, Backlight on Time, Power Saving Timeout, Monitoring LCD Cycle, Trigger Sample Width, and Cut Cable Detection.

a. Reset Factory Defaults

This function returns all the **Minimate Blaster** setups to the original factory defaults. If you choose to reset the monitor, all of your setups will be lost and replaced with the factory defaults. You can reprogram your setups again anytime you want.

WARNING: Resetting the Factory Defaults deletes your existing setups. Your setups will be lost.

To reset factory defaults, press the **Option** key and the **Setups** key together when the Main Window is displayed. The Reset Factory Defaults Window appears. Press the **Enter** key to continue or the **Cancel** key to exit. Press and hold the **Enter** key for five seconds to reset the factory defaults or press the **Cancel** key to move to the next window.

b. Auto Window

When the Record Stop Mode is set to **AutoRecord**, the Auto Window determines the length of time the **Minimate Blaster** continues to record for after an event's activity falls below the trigger level. This ensures that an event's activity, particularly air blast, is recorded. For example, if you plan to record an event at a long distance from the source, set the Auto Window to a large value to compensate for the time required for the air blast to travel from the source to the monitor's microphone. If you set the value to a small value, the monitor may stop recording after the seismic activity reaches it but before the air blast reaches it. The Auto Window values range from one to nine seconds.

To set the Auto Window, press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the Auto Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the time setting. Press the **Enter** key to save your setting.

c. Password

This feature activates a password control requiring an operator to enter a password before being able to exit the monitor mode. The password prevents an unauthorized exit from monitor mode while still allowing an operator to view event summaries. Password control can be enabled or disabled. The default password is four up arrows in a row. Passwords may include any combination of the Up Arrow key, Right Arrow key, Setups key, Test key, and the Start Monitor key. Passwords can be enabled in all monitoring modes except the advanced mode.

To display the password feature, press the **Option** key and the **Setups** key together when the main window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the **Password** window appears. Use the **Up** or **Right Arrow** key to display Enabled to turn the password on or Disabled to turn the password off. Press the **Enter** key. Enter a password and press the **Enter** key. Enter the password again to confirm your original choice and press the **Enter** key.



d. Auxiliary Trigger

The auxiliary trigger is an external triggering mechanism used to start monitor recording.

A variety of optional auxiliary triggers are available including the DS 20 Wire Trigger (677A9601), and the BlastMate Trigger Cable (712A3901) used to connect several monitors together for multiple point blast monitoring.

To use the auxiliary trigger, set the monitor in the single shot or continuous record mode. Set a fixed record time. The auxiliary trigger does not operate in the auto record time setting. Press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window and display the Auto Window. Press the **Enter** key to display the Auxiliary Trigger Window. Use the **Up** or **Right Arrow** key to display Enabled to turn the auxiliary trigger on or Disabled to turn the auxiliary trigger off. Press the **Enter** key to save your setting.

e. Backlight On Time

This command sets the length of time the backlight remains on. If enabled, the backlight is turned on by pressing the **Option** key and the **Cancel** key together. An adjustable timer, from 0 to 255 seconds, determines the length of time the backlight remains on. To disable the backlight and not have it turn on, set the timer delay to 0. This conserves battery power.

To set the backlight timer, press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the Backlight On Time Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the time setting. Press the **Enter** key to save your setting.

f. Power Saving Timeout

The Power Saving Timeout is a timer that automatically turns the **Minimate Blaster** off when it has remained in the ready to monitor mode with the Main Window displayed for a specified period of time. To turn the monitor on again, press and hold the **Enter** key.

To set the power saving timer, press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the Power Saving Timeout Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the time setting. Press the **Enter** key to save your setting.

g. Monitoring LCD Cycle

The Monitoring LCD Cycle is a timer that automatically starts a power saving mode. While in this mode, the **Minimate Blaster** minimizes power consumption while continuing its monitoring operations. The monitor display cycles off for the time period set in this command, turns on the display momentarily, then cycles again. To turn this feature off, set the time to zero. To reactivate the monitor and see the display, press the **Enter** key.

To set the monitoring LCD cycle, press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the Monitoring LCD Cycle Window appears. Use the **Right Arrow** key to move the cursor and the **Up Arrow** key to change the time setting. Press the **Enter** key to save your setting.

h. Trigger Sample Width

You can specify the number of consecutive samples that must exceed the trigger level before the unit will start recording. The default is 1 sample, with an option of 1-3 samples.



To set the trigger sample width, press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the Trigger sample width Window appears. Use the **Up Arrow** key to change the setting. Press the **Enter** key to save your setting.

i. Cut Cable Detection

This setting is used to automatically disable a geophone channel as a trigger if the cable is cut or damaged. While in continuous mode, the unit checks each geophone channel after an event is recorded. If there is a problem, the unit automatically disables that channel as a trigger source for subsequent events. This feature does not apply to the single-shot, manual, histogram or histogram combo modes.

To enable cut cable detection, press the **Option** key and the **Setups** key together when the Main Window is displayed. Press the **Cancel** key to exit the Reset Factory Defaults Window. Press the **Enter** key to scroll through the windows until the Cut Cable Detection Window appears. Use the **Up Arrow** key to change the setting. Press the **Enter** key to save your setting.

3.12.2. Option Key + Test Key = Review Setups

Press these two keys together to review the **Minimate Blaster** setups. Reviewing the **Minimate Blaster** setups scrolls you through the current settings allowing you to check the setups without having to enter the individual window for each setting.

3.12.3. Option Key + Enter Key = On-Line Help

Press these two keys at the same time to see help information on the display.

3.12.4. Option Key + Cancel Key = Backlight ON

Pressing the **Option** key and the **Cancel** key together turns on the backlight and illuminates the display.

3.12.5. Option Key + Up Arrow Key = Down Arrow

Pressing these two keys together acts as a down arrow.

3.12.6. Option Key + Right Arrow Key = Left Arrow

These keys, when pressed together, act as a left arrow.

3.13. Right Arrow Key

The **Right Arrow** key scrolls through windows and moves the cursor position within windows.



4. REFERENCE

This chapter discusses wall and ceiling installation procedures, and the theory of operation for the InstanTel® standard transducer, microphone, Sensorcheck, anti-alias filter, and data analysis techniques.

4.1. Additional Installation Procedures

The following sections outline procedures to install the standard transducer on walls and ceilings.

4.1.1. Standard Transducer Wall Installation

Refer to the installation illustration below and follow the instructions to install the standard transducer and wall mount kit.

To complete this installation you will need the following tools:

1. Hammer
2. 19mm (3/4 inch) deep-throated socket and ratchet
3. 13mm (1/2 inch) wrench
4. 12mm (.47 inch) drill bit and drill

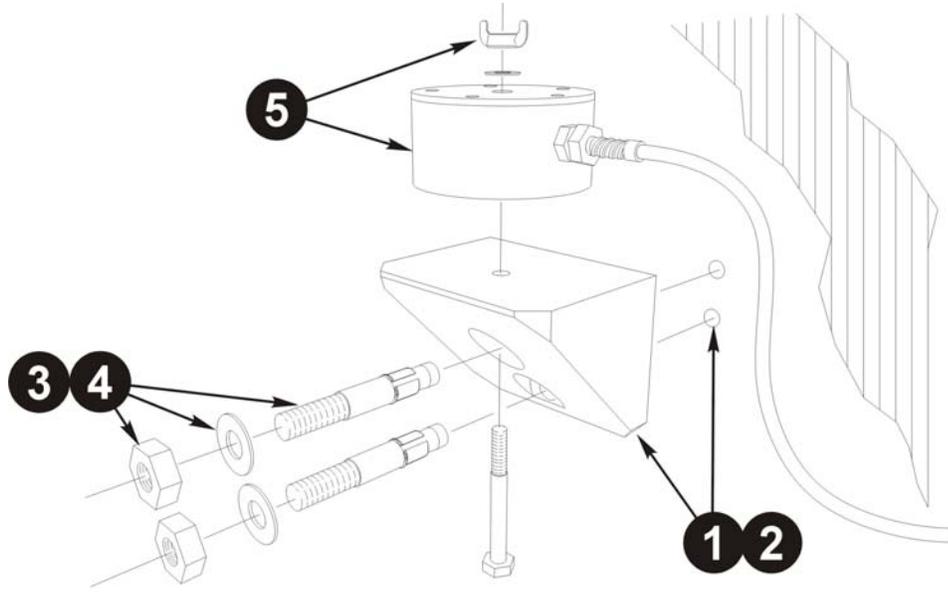
(1) Using the Geophone Wall Mount as a template, orient the block as shown, and mark the location of the two holes to be drilled.

(2) Remove the Geophone Wall Mount, and drill two 12mm (.47 inch) diameter holes; drill the holes to a depth of 89mm (3.50 inches).

(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 32mm (1.25 inches) 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 this 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. Hand-tighten the wing nut – DO NOT use a wrench or pliers to tighten the wing nut, as this may damage the Geophone.



NOTE: To install the Geophone Wall Mount, dependent on your application, you may need to acquire alternative mounting hardware than what has been provided with this kit.

4.1.2. Standard Transducer Ceiling Installation

You can install the standard transducer on a ceiling by itself or with the optional leveling plate where leveling adjustments are required.

The transducer may be installed on level ceilings where no leveling adjustments are required. To mount a transducer, install a bolt into the ceiling according to the manufacturer's instructions. Hold the transducer in the upright position and slide it over the bolt. This ensures the vertical geophone, located inside the transducer, maintains its original axis. Point the arrow in the direction of the event. Slide on 3/8 inch (9.5 mm) washer and a 3/8 inch (9.5 mm) lock washer over the bolt and tighten with the retaining nut. Press the **Test** key to check your sensors using Sensorcheck.



Figure 16 Installing the Standard Transducer on a Ceiling Right Side Up.

The standard transducer may also be mounted on a ceiling using the leveling plate. This requires optional extended leveling feet for the leveling plate. Secure the standard transducer to the



leveling plate with the three screws provided. Remove the existing leveling feet and replace with the extended leveling feet. Screw the leveling feet through the bottom of the leveling plate. Place the assembly on the ceiling with the transducer right side up and the arrow pointing in the direction of the event. Mark the position of the bolt. Install the bolt into the ceiling according to the manufacturer's instructions. Slide the leveling plate with the transducer over the bolt. Slide a 3/8 inch (9.5 mm) washer and a 3/8 inch (9.5 mm) lock washer over the bolt. Screw on the retaining nut to hold the unit in position. Level the assembly by adjusting the leveling feet. The integrated bubble level cannot be seen when installing the leveling plate on a ceiling. Use a level to check the installation. Tighten the retaining nut on the bolt to secure the installation. Press the **Test** key to check your sensors using Sensorcheck.

4.2. Theory of Operation

This section describes how InstanTel's transducer and microphone operate. It also discusses InstanTel's Sensorcheck program, anti-alias filter, and the data analysis techniques used to calculate monitoring results.

4.2.1. Transducer

A transducer measures ground vibrations. The actual mechanism inside the transducer is called a geophone. Transducers have either one geophone, called uniaxial transducers, or three geophones, called standard transducers.

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 Lenz's 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.

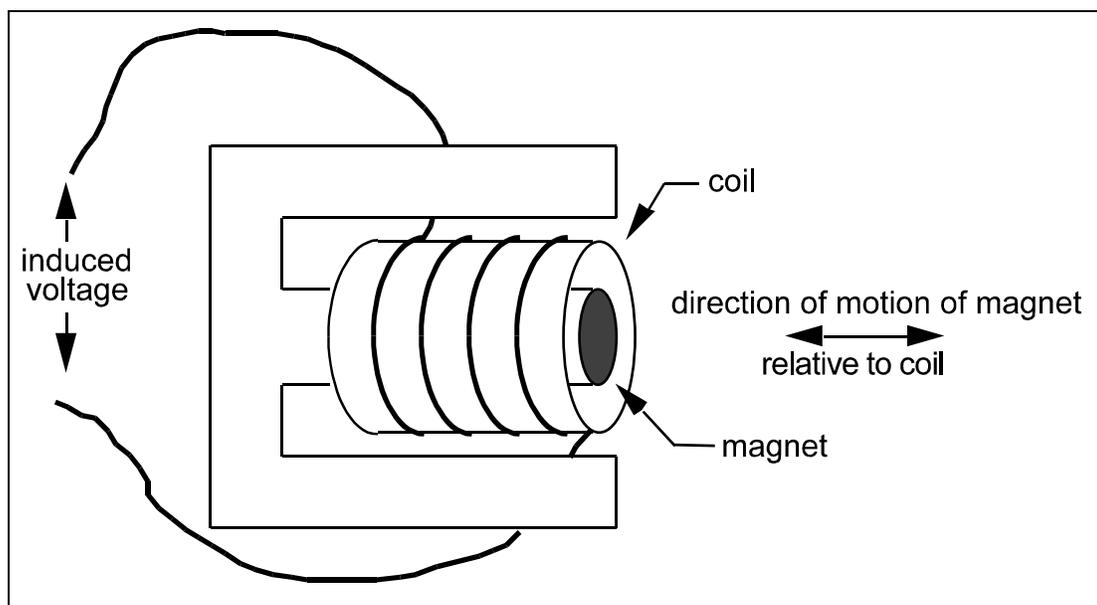


Figure 17 Geophone Sensor Operation.

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 which is proportional to particle velocity.

b. InstanTel Standard Transducer

InstanTel offers a 2 to 300 Hz standard transducer in a round package. The transducer may be installed on a floor, wall, or ceiling using a variety of installation procedures including ground spikes, burying, mounting rod, wall mount or optional leveling plate with leveling feet and integrated bubble level. The figure below includes an InstanTel Standard Transducer (a) and a Standard Transducer with leveling plate (b).



Figure 18 InstanTel Standard Transducer (a) and Standard Transducer with the Optional Leveling Plate (b).

c. Transducer Calibration Requirements

The geophone sensors inside the **Minimate Blaster** and inside InstanTel's transducers must be calibrated annually by InstanTel or an authorized InstanTel service facility. Contact your dealer for further information.

4.2.2. Microphone

The microphone measures air overpressure and comes with a three foot (one meter) microphone mounting stand.

a. Measurement Scales

Linear "L" measurement is generally used to measure the effect of low frequency air overpressure 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 microphone must be calibrated annually by InstanTel or an authorized InstanTel service facility. Contact your dealer for further information.



4.3. Sensorcheck

Sensorcheck performs a two stage test on the **Minimate Blaster** and its sensors. In the first stage, the program displays the **Minimate Blaster** serial number, software version, the total amount of memory installed in the **Minimate Blaster**, the total amount of memory available to store events, and the number of events presently stored in memory. The second stage tests each geophone within Instantel's transducer and the microphone operation. The program also tests the operation of the **Minimate Blaster** itself and the sensor connecting cables. Pass or fail results appear on the display. See the Basic Reference chapter of this manual to choose when Sensorcheck operates automatically.

4.3.1. Checking the Standard Transducer Geophones

Sensorcheck measures a geophone's natural frequency and damping indicated by an Overswing Ratio (OR). Sensorcheck sends an electric pulse to the geophones and measures the response. If the geophone response falls within a specified calibration range, the geophone is in calibration and monitoring operations can continue. If the geophone response does not fall within a specified calibration range, the geophone is not working properly. You cannot record events until you fix or replace the geophones. See the troubleshooting section of this manual for the appropriate procedures to follow.

a. Natural Frequency

Waveform measurements check the natural period (t) of a geophone sensor coil assembly. Referring to the figure below, the distance from P₁ to P₂ 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.

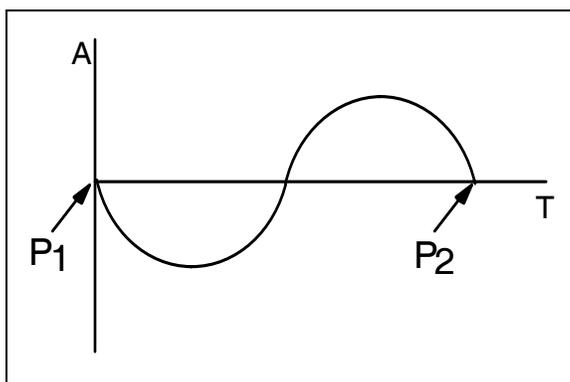


Figure 19 Calculating a Geophone's Natural Frequency.

b. Damping – Overswing Ratio (OR)

The overswing ratio (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 overswing ratios range from 2.8 to 4.8. The figure below displays a graph of a “free fall” response for a geophone coil. A₁ and A₂ are used for overswing calculations.

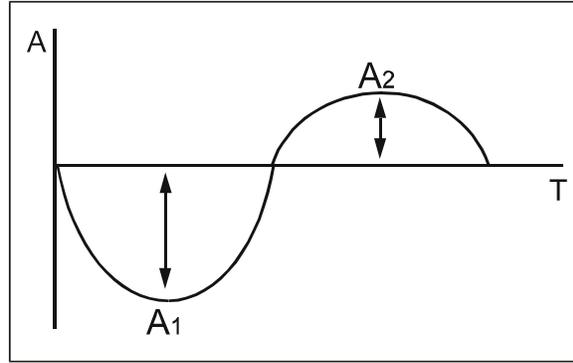


Figure 20 Calculating a Geophone's Overswing Ratio.

4.3.2. Checking the Microphone

Sensorcheck tests the microphone's 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.

4.3.3. Sensorcheck Report

The Sensorcheck report appears on the **Minimate Blaster** display. The message "All Channels Working, Press Option + Test to Review Setups" indicates the **Minimate Blaster** sensors have passed the Sensorcheck.

4.4. 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.

4.5. Data Analysis Techniques

The following sections define the **Minimate Blaster** data analysis techniques. The first section, vibration, discusses calculations applied to event data recorded by a transducer. The second section, sound pressure, describes the microphone event data calculations.

4.5.1. Vibrations

The **Minimate Blaster** calculates the Peak Particle Velocity, Zero Crossing Frequency, Peak Acceleration, and Peak Displacement for each of the, transverse, vertical, and longitudinal axes. The **Minimate Blaster** calculates Peak Vector Sum using data from all three axes.

a. Peak Particle Velocity (PPV)

Peak Particle Velocity indicates the maximum speed particles travel resulting from an event's vibration. The **Minimate Blaster** calculates the PPV for each geophone.

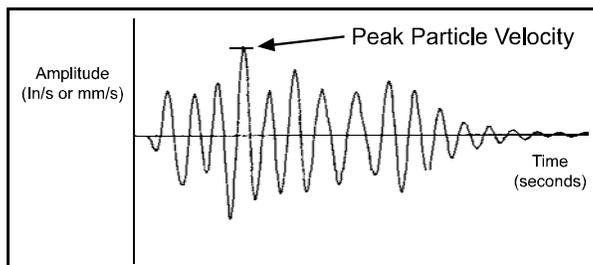


Figure 21 Calculating Peak Particle Velocity.

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 Blaster** measures between zero crossings. Frequency is the number of periods that occur in one second calculated by the formula: $\text{Frequency} = 1/\text{period}$.

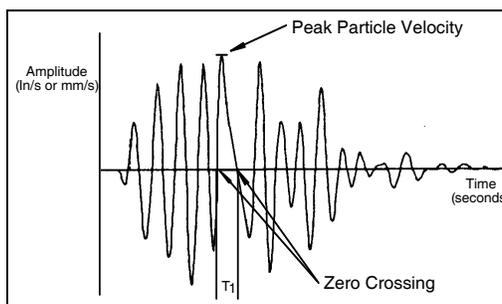


Figure 22 Calculating the Zero Crossing Frequency.

(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 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.

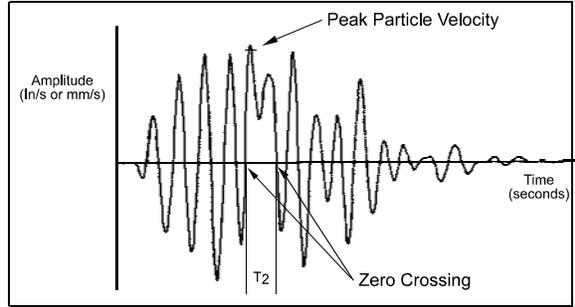


Figure 23 Zero Crossing Frequency Calculation Limitation.

(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 Blaster** 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 Blaster** does not calculate frequencies above 100 Hz because of the high error level at 1024 samples per second. The message ">100 Hz" displays. At 2048 samples per second, the message ">200 Hz" displays. When recording at 4096 samples per second, the message ">400 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 **Blastware** software.



c. Peak Acceleration

The **Minimate Blaster** 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 Blaster** 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 Blaster** 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 Blaster** calculates peak displacement, or particle distance traveled, by multiplying speed by time. In the **Minimate Blaster** 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:

$$V = \text{the velocity in each interval}$$

To obtain the peak displacement, the **Minimate Blaster** 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

Figure 24 Calculating the Peak Vector Sum.

The **Minimate Blaster** 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.

4.5.2. Pressure

The **Minimate Blaster** calculates two air overpressure indicators, peak sound pressure and zero crossing frequency.

a. Peak Sound Pressure (PSP)

The **Minimate Blaster** checks the entire event waveform and displays the largest sound pressure called the Peak Sound Pressure (PSP), also referred to as the Peak Air Overpressure. Results appear on the **Minimate Blaster** 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 Linear “L” microphones only.

4.6. Alternate Manual Waveform Calculations

The following sections discuss manual waveform analysis techniques. These have been included for reference purposes only. They do not represent the calculation techniques employed by the BlastMate III.

Graphical methods for calculating area and slope depend on the shape of the waveform being analyzed. A complete discussion of the procedures is beyond the scope of this manual. Two useful reference texts are G. A. BOLLIGER, *BLAST VIBRATION ANALYSIS*, Southern Illinois University Press and CHARLES H. DOWDING, *BLAST VIBRATION MONITORING AND CONTROL*, Prentice-Hall Inc.

In each of the subsequent examples some formulae appear with no attempt at derivation. The following definitions apply:

A = amplitude in inches/second measured from the zero line

A_m = amplitude measured in millimeters/second

T = period in seconds

Y = absolute change in amplitude over time measured in inches/second



Y_m = absolute change in amplitude over time measured in millimeters/second

4.6.1. Sinusoidal Waveforms

The motion is essentially sinusoidal with gradual amplitude and frequency changes.

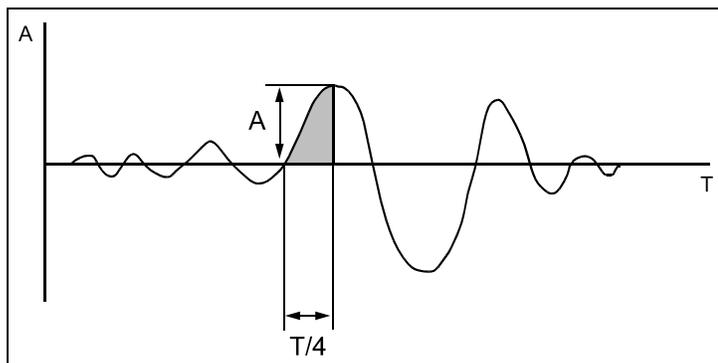


Figure 25 Manual Waveform Calculations on Sinusoidal Waveforms.

a. Calculating Displacement:

$$\text{Maximum Displacement (in.)} = \frac{T}{2\pi} \times A$$

$$\text{Maximum Displacement (mm)} = \frac{T}{2\pi} \times A_m$$

b. Calculating Acceleration:

$$\text{Maximum Acceleration (in./s}^2\text{)} = \frac{2\pi}{T} \times A$$

$$\text{Maximum Acceleration (mm/s}^2\text{)} = \frac{2\pi}{T} \times A_m$$

4.6.2. Nearly Triangular Waveforms

Motion is irregular and has large amplitude.

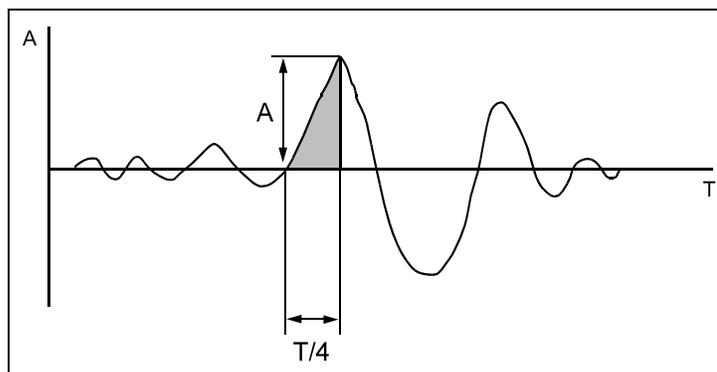


Figure 26 Manual Waveform Calculations on Nearly Triangular Waveforms.

**a. Calculating Displacement:**

$$\text{Maximum Displacement (in.)} = \frac{T}{8} \times A$$

$$\text{Maximum Displacement (mm)} = \frac{T}{8} \times A_m$$

b. Calculating Acceleration:

$$\text{Maximum Acceleration (in./s}^2\text{)} = \frac{1}{T} \times Y$$

$$\text{Maximum Acceleration (mm/s}^2\text{)} = \frac{1}{T} \times Y_m$$

4.6.3. 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.

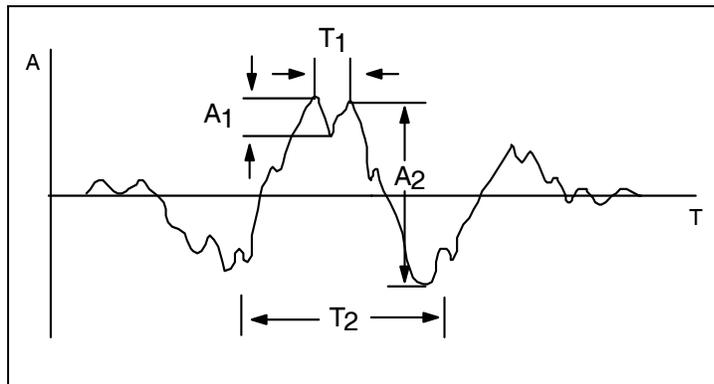


Figure 27 Manual Waveform Calculations on Compound Waveforms.

a. Calculating Displacement:

$$\text{Maximum Displacement (in.)} = \frac{T_1}{2\pi} \times A_1 + \frac{T_2}{2\pi} \times A_2$$

$$\text{Maximum Displacement (mm)} = \frac{T_1}{2\pi} \times A_{1m} + \frac{T_2}{2\pi} \times A_{2m}$$

b. Calculating Acceleration:

$$\text{Maximum Acceleration (in./s}^2\text{)} = \frac{2\pi}{T_1} \times A_1 + \frac{2\pi}{T_2} \times A_2$$

$$\text{Maximum Acceleration (mm/s}^2\text{)} = \frac{2\pi}{T_1} \times A_{1m} + \frac{2\pi}{T_2} \times A_{2m}$$



4.6.4. Irregular Waveforms

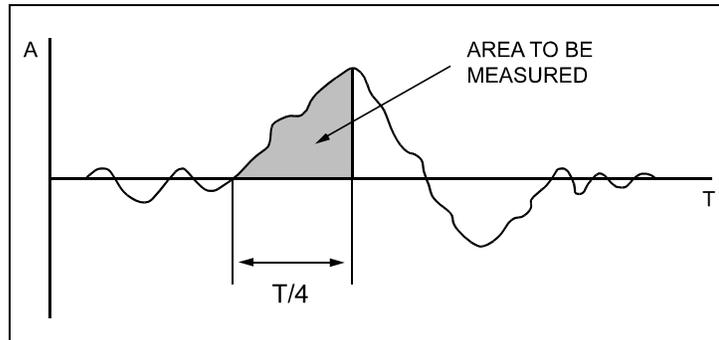


Figure 28 Manual Waveform Calculations on Irregular Waveforms.

a. Calculating Displacement:

Maximum Displacement = area under curve measured by a planimeter.



Notes:



5. MAINTENANCE

This chapter outlines maintenance procedures for the **Minimate Blaster** including battery charging, annual sensor calibration, and cleaning.

5.1. Battery Charging

The **Minimate Blaster** internal battery requires periodic and regular charging. To check the battery charge, turn the **Minimate Blaster** on and read the battery level from the Main Window. If a number appears in this window instead of the bars, charge the monitor immediately to avoid possible battery damage. Keep the unit on charge when not in use, or charge and then disconnect the battery if storing for prolonged periods of time.

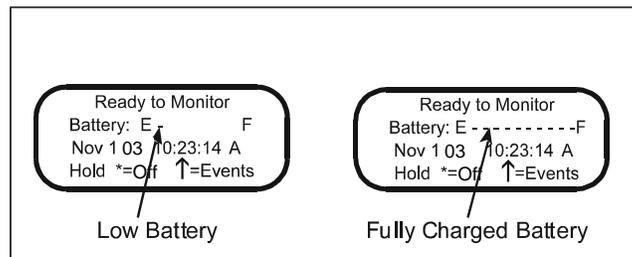


Figure 29 Battery Level Indicator.

WARNING: Do not allow the battery to become discharged and left in a discharged state for any extended period of time. Allowing the battery to become discharged may cause permanent damage to the battery. Always charge the monitor in a well ventilated area.

To charge the battery, plug the AC adapter into the top connector located on the right-hand side of the **Minimate Blaster**. Plug the other end into a 120 VAC 60 Hz electrical outlet. The battery charging indicator light turns on. For electrical outlets other than 120 VAC 60 Hz, you must use an optional power converter; see your dealer for more information.

All **Minimate Blaster** monitors use the DV-1250 AC adapter, provided with each monitor. The adapter restricts the voltage and current to no more than 12 VDC at 500 mA. Voltage can increase to 13.8 VDC without damaging the monitor. For example, an AC adapter with an output rating of 12 VDC at 1000 mA may be used as long as the voltage does not exceed 13.8 VDC for loads over 500 mA when used with a monitor. Check the manufacturer's specifications carefully to ensure the AC adapter does not exceed the maximum voltage and current specifications.

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. Instantel's warranty does not cover this type of damage.

Instantel recommends using the DV-1250 AC adapter supplied with each monitor. Replacements can be ordered from Instantel. A 220 VAC adapter (p/n DV-1250UP) is also available from Instantel for use with the DV-1250 110 VAC adapter.



If required, other AC adapters may be used but must meet the following restrictive specifications.

Minimum Voltage Required by the Monitors	Maximum Output	Maximum No Load Voltage (VDC)	Maximum Power (VA)	Safety Rating (equal to)	Length of Cord	Plug Style and Size
11 VDC	less than 13.8 VDC for loads over 500 mA	18.8	12 maximum 6 recommended	CSA/UL	3 m (10 ft.)	2.1 mm Coaxial center post positive

5.2. Annual Calibration Requirements

The Unit, Standard Transducer, and the microphone require annual calibration to ensure continued accurate monitoring results. Calibration may be performed by an authorized InstanTEL service facility or by InstanTEL. Contact your dealer to arrange to have your **Minimate Blaster** and its sensors calibrated.

5.3. Cleaning the Minimate Blaster

Vacuum dust, dirt, and sand from the **Minimate Blaster**. Use isopropyl alcohol to remove stains. Do not use paint thinners or ketone solvents. These may damage the **Minimate Blaster**. To avoid scratching the protective cover and display, do not scrub the surfaces with abrasive material including cleaning pads.



6. TROUBLESHOOTING

Use the following information to help solve operation problems.

FAULT	PROBABLE CAUSE	CORRECTIVE ACTION
The monitor does not turn ON.	No power source.	Verify 120 VAC is supplied. Check the battery.
The monitor does not turn ON	Battery needs recharging.	Recharge the battery.
with battery only but does turn on using the AC Adapter.	Battery is dead.	Contact your authorized service facility.
	Batter is not connected	See Figure 1, Page iv for directions on connecting the battery.
The monitor sounds a “Beep“	Battery needs recharging.	Recharge the battery.
The monitor turns off unexpectedly.	Monitor has entered Power Saving Mode.	Press the Enter key to activate the monitor.
	Battery needs recharging.	Recharge the battery.
	Battery is dead.	Contact your authorized service facility.
The monitor fails to trigger and record an event.	The monitor is not in monitor mode.	Press the Start Monitor key to enter monitor mode.
	Trigger Level set too high.	Lower Trigger Level.
The monitor triggers continuously.	Trigger Level set too low.	Raise the Trigger Level.
	Noisy electric power supply.	Connect the monitor to a dedicated electric power supply line with no line noise or use a broadband noise filter.
The monitor does not record events.	The monitor’s memory is full.	Transfer events from the memory, verify the events transferred okay, then delete the events.
Warning Memory Less than 15%.	The monitor’s memory is almost full.	Transfer events from the memory, verify the events transferred okay, then delete the events.
Memory Full.	The monitor’s memory is full.	Transfer events from the memory, verify the events transferred okay, then delete the events.
Backlight does not turn ON.	Backlight on time set to zero.	Increase the backlight on time.
	Low Battery level .	Check the battery level and charge battery, as required.



FAULT	PROBABLE CAUSE	CORRECTIVE ACTION
Check Channel(s): Tran Message.	Transducer not connected.	Connect the transducer.
	The transducer not installed level.	Check the transducer installation for level.
	The transducer moved during Sensorcheck.	Press the Test key to run Sensorcheck again. Do not touch the transducer.
	Transducer cable improperly installed or damaged.	Check the cable connections and cables.
	Damaged transducer.	Have the transducer checked by an authorized InstanTEL service facility.
Check Channel(s): Vert Message.	Transducer not connected.	Connect the transducer.
	Transducer not installed level.	Check the transducer installation for level.
	Transducer moved during Sensorcheck.	Press the Test key to run Sensorcheck again. Do not touch the transducer.
	Transducer cable improperly installed or damaged.	Check the cable connections and cables.
	Transducer installed upside down.	Check the transducer for the arrow on the top.
	Damaged transducer.	Have the transducer checked by an authorized InstanTEL service facility.
Check Channel(s): Long Message.	Transducer not connected.	Connect the transducer.
	Transducer not installed level.	Check the transducer installation for level.
	Transducer moved during Sensorcheck.	Press the Test key to run Sensorcheck again. Do not touch the transducer.
	Transducer cable improperly installed or damaged.	Check the cable connections and cables.
	Damaged transducer.	Have the transducer checked by an authorized InstanTEL service facility.
Check Microphone Message.	Microphone not connected.	Connect the microphone.
	Damaged microphone or microphone cable.	Have the microphone checked by an authorized InstanTEL service facility.



Appendix



a) Minimate Blaster Specifications

The Minimate Blaster is fully compliant with the International Society of Explosives and Engineers (ISEE) performance specifications for blasting seismographs.

Seismic	Range	10 in/s (254 mm/s).
	Resolution	0.005 in/s (0.127 mm/s), to 0.000625 in/s (0.0159 mm/s) with built-in preamp.
	Trigger Levels	0.005 to 10 in/s (0.127 to 254 mm/s) in steps of 0.001 in/s (0.01 mm).
	Frequency Analysis	National and Local Standards for most countries (see text).
	Accuracy	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz.
	Acceleration, Displacement	Calculated using entire waveform, not estimated at peak.
Air Overpressure Monitoring	Range	88–148 dB, 7.25×10^{-5} psi to 0.0725 psi, 0.5 Pa to 500 Pa.
	Resolution	0.1 dB above 120 dB (0.25 Pa).
	Trigger Levels	100–148 dB in 1 dB steps.
	Accuracy Range	+/- 10% or +/- 1 dB, whichever is larger, between 4 and 125 Hz
	Frequency Range	2 to 250 Hz between 13 dB roll off points
Sampling Rate		1024 to 4096 Hz per channel (independent of record time).
Event Storage	Full Waveform Events	300 at standard sample rate of 1024.
	Summary Events	1750 at standard sample rates of 1024.
Frequency Response	2 to 300 Hz	Ground and Air, Independent of record time.
Full Waveform Recording	Fixed Record Modes	Manual, continuous and programmed start/stop.
	Record Stop Mode	Fixed record time, AutoRecord™ , record stop mode.
	Record Time	1 to 20 sec (programmable in one-second steps) plus 0.25 seconds pre-trigger.
	AutoRecord™ Time	Quiet window programmable from 1 to 9 seconds, plus a 0.25 second pre-trigger. Event is recorded until activity remains below trigger level for duration of quiet window, or until available memory is filled.
Special Functions	Timer Operation	Programmed start/stop.
	Self Check	Programmable daily check.
	Scaled Distance	Weight and distance stored with event.
	Monitor Log	History printout programmable up to all events stored.
	Measurement Units	Imperial or metric, dB or linear air pressure.
	Location	Log GPS (Global Positioning System) data into record.
User interface	Keyboard	8 domed tactile with separate keys for common functions.
	Display	4 line by 20 character high contrast backlit display with on-line help.
Battery Life		210 hours continuous recording, 25 days with timer.
Dimensions		3.2" x 3.6" x 6.3" (81 mm x 91 mm x 160 mm).
Weight		3 lbs. (1.4 kg).
Warranty	2 Years Parts and Labor	Calibration and equipment check required at 1 year to maintain warranty.
Environmental	LCD	14 to 122 degrees F (–10 to 50 degrees C) operating.
	Electronics	–4 to 140 degrees F (–20 to 60 degrees C) operating.
	Humidity	5 – 90% RH non – condensing
	Storage	–4 to 160 degrees F (–20 to 70 degrees C).

Instantel reserves the right to change any specifications without notice.



b) Parts and Accessories

DESCRIPTION	PART NUMBER
Monitor	
Minimate Blaster with Standard Transducer	714A3001
Transducer	
Standard Triaxial Geophone (Series III): With 2 m (6 ft.) cable.	714A9701
Triaxial Geophone Leveling Plate: Complete with leveling feet and spirit level.	714A1801
Triaxial Geophone Wall Mount Kit: Used to mount a triaxial geophone to a wall, or other vertical surface. Includes aluminum mounting block, bolts, and instructions.	718A0101
Microphones	
Linear Microphone Assembly (Series III): With 2 m (6 ft.) cable.	714A9801
Microphone Windscreen: Foam ball for use with microphone assemblies.	1712
Microphone Stand Assembly	714A3401
AC Adapter	
110 V AC Adaptor (Origin - China): For use with Instantel Series III and new Series II	DV – 1250
220 V AC Adaptor (Origin - China): For use with Instantel Series III and new Series II	DV – 1250UP
12 V Battery/Power Supply Cable: Provides external power connectors for Series III and new Series II monitors to connect to a car battery or alternate power supply.	714A2401
Extension Cables	
Extension Cable Line Driver, 30 m (100 ft.): Extension cable for Standard Triaxial Geophone (p/n 714A9701).	714A7601
Extension Cable Line Driver, 75 m (250 ft.): Extension cable for Standard Triaxial Geophones (p/n 714A9701).	714A7602
Accessories	
Minimate Plus to Blastmate III Cable: RS-232 cable for uploading settings from a Blastmate III monitor to a Minimate Plus monitor, or downloading data from a Minimate Plus monitor to a Blastmate III monitor.	716A1801
Remote Alarm Controller: Self-contained controller complete with high power auxiliary drive capability for external sirens and other alarms.	711A1401
DS-20 Wire Break Trigger Package: Includes connector cable and instructions.	677A9601
Master/Slave Trigger Cable: Used to trigger one Instantel monitor from another in a master/slave configuration. Not available for Minimate monitor (DS-077).	712A3901
Null Modem Cable: For use when connecting a modem to an Instantel monitor. One null modem cable required for each monitor.	714A7501
Accessory Case with Foam Insert: Rigid plastic case similar to Blastmate case - used to store and carry accessories. Can also be used to store and carry 1 or 2 Minimate , Minimate Blaster , or Minimate Plus monitors.	714A2601



c) Compliance Reports

The **MiniMate Blaster** supports numerous Compliance Reports, also called National Frequency Analysis Standards, including U.S.A. USBM/OSMRE, British Standard BS 6472, French GFEE, German DIN 4150, New Zealand 4403:1976, and Spain UNE 22.381. Two frequency standards, U.S.A. USBM/OSMRE and German DIN 4150, appear below. Use the **Blastware** software to choose the Compliance Report used by your monitor.

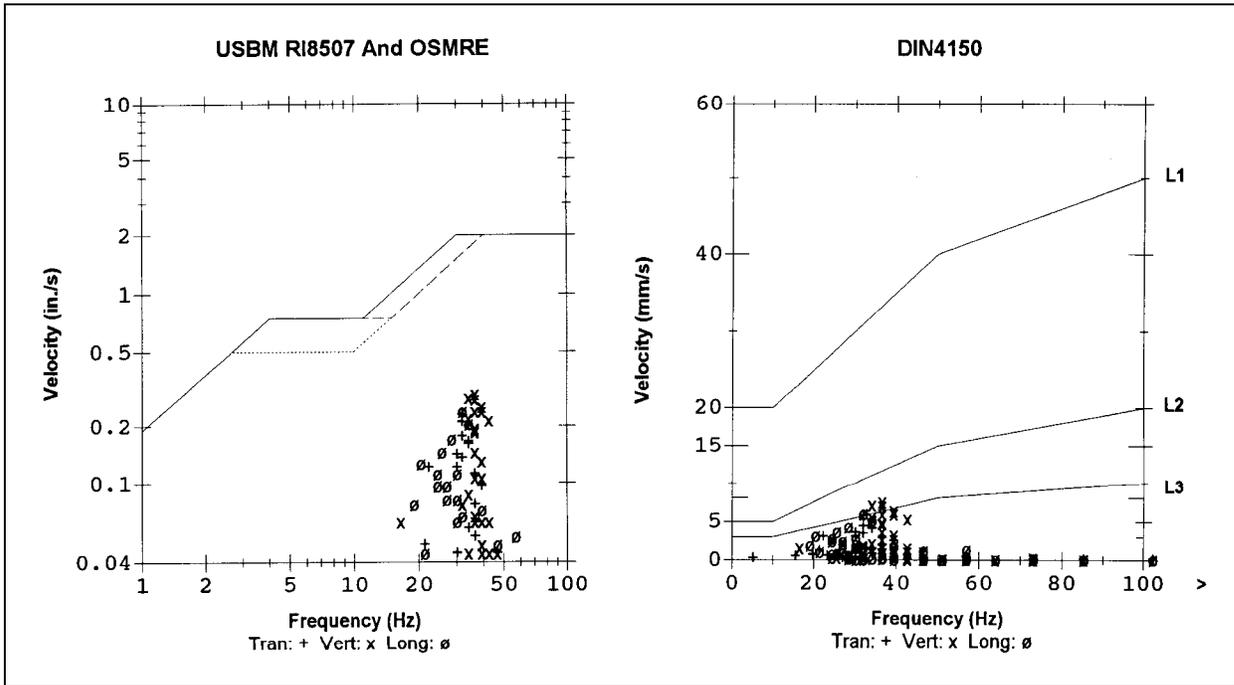


Figure A-30 United States Bureau of Mines and German DIN 4150 Compliance Reports.

Note: Data points appearing outside of the report boundaries indicates 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.

Using the optional **Blastware** Advanced Module, you can edit Compliance Reports or create an entirely new report to meet your specific needs.



d) Calculating Battery Life

The **Minimate Blaster** battery life depends on current draw, aggregate sample rate, battery longevity, and ambient temperature.

Battery Life versus Current Draw

Battery life depends on battery capacity and current draw. Battery capacity is stated in ampere hours and is the product of discharge current and discharge time. With a fully charged battery, the **Minimate Blaster** has a battery life of 10 days in monitor mode. If you use the Timer for eight hour daily monitoring, the battery life increases to approximately 25 days in monitor mode.

Note: We recommend connecting a monitor to the AC adapter or an external 12 VDC power supply.

Aggregate Sample Rate

The aggregate sample rate (sample rate x the number of recording channels) measures the effect of choosing combinations of sample rates and recording channels. The following table lists the approximate battery life at various aggregate sample rates. The first section applies to the continuous record mode. The second section applies to the histogram record mode.

Battery Life	
Sample Rate	Minimate Blaster
4096	122 Hours
2048	165 Hours
1024	210 Hours

Note: sufficient memory capacity must be available.

Battery Longevity

Battery longevity refers to a useful service life determined by the number and depth of discharge cycles. The following indicates the expected battery longevity expressed in charge/discharge cycles. **A battery lasts longer if it is kept in a charged condition.**

Depth of Discharge (Capacity)	Longevity (Charge/Discharge Cycles)
100 %	200
50 %	400
30 %	1200

Battery Capacity Varies with Ambient Temperature

Battery capacity is a function of ambient temperature and rate of discharge. At 68°F (20°C) the rated capacity is 100%. The capacity increases above this temperature and decreases below this temperature.

e) Connecting a Printer to the Minimate Blaster

A printer may be connected directly to the **Minimate Blaster** allowing you to print event summary reports and other recorded information. InstanTel supports the Hewlett Packard HP



DeskJet 320 printer. Other printer types may work with the **Minimate Blaster** if they can be configured to the settings listed in the tables below.

The diagram below illustrates how to connect the printers to a **Minimate Blaster**. The tables list the printer setups for each printer. You must set each printer to the listed setups in order for it to work properly with the **Minimate Blaster**.

Before you can connect and use a printer with the **Minimate Blaster**, you must load the required printer driver into the monitor using the **Blastware** software program. Connect the **Minimate Blaster** to your computer using the BlastMate III to PC Connecting Cable (712A2301). Start the **Blastware** program. Under the Unit menu, choose the Reload Operating System command. Select the printer driver type. Click on the Reload Library and Components Only button. The information will be transferred to the monitor.

Tools and Materials Required:

- BlastMate III PC Connecting Cable (712A2301 – supplied).
- Serial/Parallel Converter (Recommended – Greenwich Instruments GA935 – not supplied).
USA Tel:704-875-8490, UK Tel: (020) 8302-4931, Germany Tel: +49893072165
- HP DeskJet 320 printer.

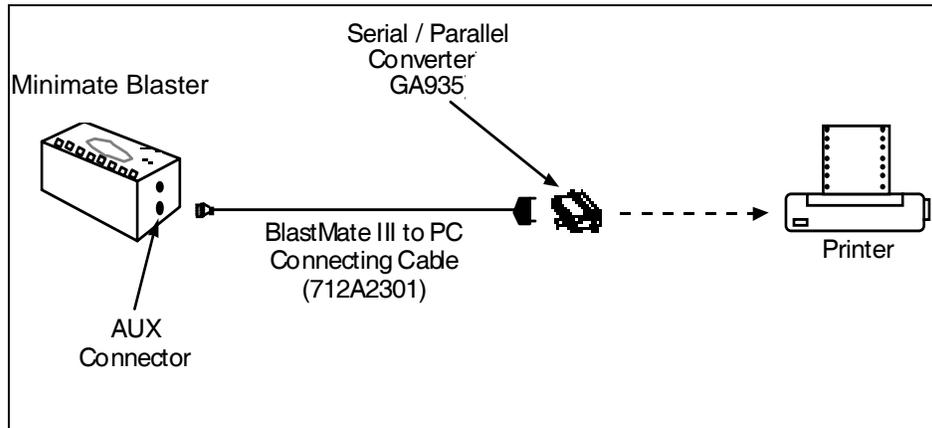


Figure A-31 Connecting the Minimate Blaster to a Printer.

Step 1: Configure the Printer.

You must configure the printer to work with your **Minimate Blaster**. Follow the instructions in your printer's user's manual. Configure the printer to the settings appearing at the end of this section. Turn the printer OFF.

Step 2: Connect the Serial/Parallel Converter to the Printer.

Plug the Serial/Parallel converter into the printer's parallel port located on the printer.

Step 3: Connect the Minimate Blaster to the Serial/Parallel Converter.

Using the BlastMate III to PC Connecting Cable (712A2301), connect one end to the Aux connector on the **Minimate Blaster**. Connect the other end of the cable to the Serial/Parallel Converter.

Step 4: Turn the Minimate Blaster ON.

Step 5: Turn the Printer ON.

Caution! Always perform this step last.



Printer Settings

Configure the HP DeskJet 320 or the Canon BJ-30 printers to the required settings outlined below. The HP DeskJet 340 and Canon BJC-80 do not require configuring.

a. HP DeskJet 320

Set the HP DeskJet 320 printer settings to the following:

Printer Settings	
Battery Control	None
Media Source	Sheet Feeder or Manual Feed
Media Size	U.S. Letter
CR Def.	CR only
Perf. Skip	On
Text Scale	Off
Character Set	PC-8 USA

b. Canon BJ-30

Set the BJ-30 print set-up parameters to the following:

Operator Panel Settings	
Print Mode	Any setting
Reduction Mode	1/1
Control Mode	LQ
Font / Function	Any setting
Epson LQ Mode Settings	
(1) Horizontal Print Position	OFF
(2) Not Used	—
(3) Text scale mode	OFF
(4-5) Top Margin	OFF
(6) Smoothing mode	OFF
(7) Automatic Power Off	Any setting
(8) Font Typeface lock mode	OFF
(9) Input / download buffer	OFF
(10) Automatic line feed (LF)	OFF
(11-13) International character set	All OFF
(14) Character set	Any setting
(15-18) Code page	All OFF
(19) Automatic emulation switching mode	OFF
(1A) Low ink warning	Any setting



Notes:



Index

A

- A Weight
 - and zero crossing frequency, 4–10
 - microphone units, 3–11
- Accessories, 1–2, 2
- Adapter
 - charging the battery, vi
 - voltage, vi
- Adjust Clock Speed, 3–8
- Aggregate Sample Rate, 5
- Alarm Level
 - geophone, 3–11
 - microphone, 3–11
- Analysis Techniques, 4–6
- Antialias Filters, 4–6
- Auto Record Time, 3–7
- Auto Window, 3–16
- Auxiliary Trigger, 3–16

B

- Backlight On Time, 3–17
- Backlight, Option Key + Cancel Key, 3–17
- Basic Channels (Compliance Module Only), 3–11
- Battery
 - battery life, 5
 - battery life versus current draw, 5
 - battery longevity, 5
 - calculating battery life, 5
 - capacity varies with ambient temperature, 5
 - charging, vi, 5–1
 - connect the battery, vi
 - extending battery life using the timer, 3–9
 - monitoring LCD cycle to conserve battery power, 3–17
 - power saving timeout to conserve battery power, 3–17
 - turn backlight off to conserve power, 3–17
- Baudrate, direct or modem, 3–12
- Beep When Triggered, 3–12
- Burying the Standard Transducer, 3–3

C

- Calibration
 - annual requirements, 5–2
 - maintaining warranty. *See the title page, See the title page*
 - microphone calibration requirements, 4–4
 - transducer calibration requirements, 4–4

- Cancel Key, 3–15
 - exit all monitoring modes, 3–15
 - press to display the main window, 3–4
 - press to stop timer mode, 3–9
- Canon BJ–30, 7
- Ceiling Installation, 4–2
- Charge Weight, 3–8
- Cleaning the Minimate Blaster, 5–2
- Clock
 - adjusting speed, 3–8
- Compliance Reports, 4
- Compound Waveforms, 4–12
- Continuous Record Mode, 3–5
- Copy BMIII Notes, 3–15
- Customer Support. *See the title page*
- Cut Cable Detection, 3–18

D

- Daily Self Check, 3–10
- Damping, 4–5
- Data Analysis Techniques, 4–6
- Date
 - displayed in the start up window, 2–2
 - setting, 3–9
- Delete All Events, 3–13
- Direct Baudrate or Modem Baudrate, 3–12
- Distance from blast, 3–8
- Down Arrow, Option key + Up Arrow key, 3–18

E

- EC Warning. *See the title page*
- Electric Power Supply, v
- Enter * Key, 3–4
- Event Monitoring, 3–1
- Events
 - delete all events, 3–13
 - printing, 3–14
 - recording events, *see the Basic Tutorial*, 2–1
 - view events, 3–12

F

- Factory Defaults, resetting, 3–16
- False Events
 - manual record mode, 3–5
 - using the timer to minimize, 3–9
- Features and Benefits, 1–1
- Fixed Record Time, 3–7

**G**

- Geo Alarm Level (Compliance Module Only), 3–11
- Geo Range (Compliance Module Only), 3–6
- Geo Trigger Level, 3–6
- Geophone
 - geo channels, 3–11
 - geophone operation, 4–3
 - range, 3–6
 - testing, 3–10
 - trigger level, 3–6
 - trigger source, 3–6
- Geophone and Microphone as trigger source, 3–6
- Ground Spikes, 3–2
- Ground Vibrations
 - analysis techniques, 4–6
 - as trigger source, 3–6
 - types, 3–1

H

- Handling Precautions, vii
- Hard Surface Installation, 3–3
- Help, Option key + Enter key, 3–18

I

- Identification Numbers, v
- Imperial, 3–10
- Installation
 - bolting, 3–3
 - burying, 3–3
 - ceiling, 4–2
 - ground spikes, 3–2
 - hard surface installation, 3–3
 - microphone, 3–4
 - sandbagging, 3–4
 - wall, 4–1
- Irregular Waveforms, 4–13

J

- Job Number Format, 3–8

K

- Keyboard
 - description of, 3–4

L

- Left Arrow, Option key + Right Arrow key, 3–18
- Linear L
 - microphone units, 3–11
 - part number, 3
 - specifications, 2

- List Events. *See* view events
- Longitudinal Axis, 3–1

M

- Maintenance, 5–1
- Manual Record Mode, 3–5
- Manual Waveform Calculations, 4–10
- Maximum Geo Range, 3–6
- Measurement Scales, 4–4
- Measurement System, 3–10
- Memory
 - checking amount available, vii
 - checking amount installed, 3–15
 - delete events, 3–13
 - saving, 3–11
- Metric, 3–10
- Mic Alarm Level, 3–11
- Mic Trigger Level, 3–6
- Microphone
 - calibration requirements, 4–4
 - extension cable, 1–2
 - installation, 3–4
 - mic channel, 3–11
 - microphone units, 3–11
 - part numbers, 3
 - serial number, v
 - theory of operation, 4–4
 - trigger level, 3–6
 - trigger source, 3–6
 - windscreen, 3
- Microphone Units, 3–11
- Minimate Blaster
 - burying, 3–3
 - sandbagging, 3–4
- Minimate Blaster Keys, 1–3
- Models, 1–1
- Modem
 - serial connection, 3–11
 - setting the baudrate, 3–12
- Monitor Everyday, 3–9
- Monitor Once Only, 3–9
- Monitoring LCD Cycle, 3–17

N

- Natural Frequency, 4–5
- Notes Format, 3–7

O

- On/Off. *See* the Enter * key
- Option Key, 3–15
- Option Key + Cancel Key = Backlight ON, 3–18
- Option Key + Enter Key = On–Line Help, 3–18
- Option Key + Right Arrow Key = Left Arrow, 3–18



Option Key + Setups Key, 3–16
 Option Key + Test Key = Review Setups, 3–18
 Option Key + Up Arrow Key = Down Arrow, 3–18
 Overswing Ratio, 4–5

P

Parts, 2
 Password, 3–16
 Peak Acceleration, 4–9
 Peak Displacement, 4–9
 Peak Particle Velocity (PPV), 4–6
 Peak Sound Pressure (PSP), 4–10
 Peak Vector Sum (PVS), 4–9
 Power Saving Timeout, 3–17
 Precautions, vii
 Print
 all events, 3–14
 event list, 3–13
 selected event, 3–14
 Printer
 Canon BJ–30, 7
 connecting, 6
 settings, 7

R

Range, geophone, 3–6
 Record Mode, 3–5
 continuous record mode, 3–5
 manual record mode, 3–5
 Record Stop Mode, 3–7
 auto, 3–7
 fixed, 3–7
 Record Time, setting, 3–7
 Reference, 4–1
 Registration Card, vii
 Remote Alarm
 geo alarm level, 3–11
 mic alarm level, 3–11
 Reset Factory Defaults, 3–16
 Right Arrow Key, 3–18
 Right Arrow Key + Setups Key, 3–9

S

Sample Rate
 compliance module, 3–5
 Sandbagging, 3–4
 Scaled Distance, 3–8
 Sensorcheck, 3–10
 sensorcheck report, 4–6
 test key, 3–15
 theory of operation, 4–4
 Serial Connection, 3–11
 Setups Key

 compliance module, 3–5
 Sinusoidal Waveforms, 4–11
 Soft Surface Installation, 3–2
 Software Version, 2–2
 Sound Pressure, 4–10
 analysis, 4–10
 peak sound pressure (PSP), 4–10
 zero crossing frequency (ZC Freq), 4–10
 Specifications, 2
 Start Monitor Key, 3–5
 Storage Mode, 3–5

T

Test Key
 compliance module, 3–15
 Theory of Operation, 4–3
 Time
 displayed in the start up window, 2–2
 setting, 3–8
 Timer Mode, 3–9
 Transducer
 bolting, 3–3
 burying, 3–3
 calibration requirements, 4–4
 extension cable, 1–2
 hard surface installation, 3–3
 installation, 3–1
 installing using the ground spikes, 3–2
 InstanTel Standard Transducer, 4–4
 levelling plate, 1–2
 part numbers, 3
 sandbagging, 3–4
 soft surface installation, 3–2
 theory of operation, 4–3
 trigger level, 3–6
 trigger source, 3–6
 Transverse Axis, 3–1
 Triangular Waveforms, 4–11
 Trigger Level
 compliance module, 3–6
 Trigger Sample Width, 3–17
 Trigger Source
 compliance module, 3–6
 Troubleshooting, 6–1
 Tutorial, 2–1

U

Up Arrow Key, 3–12
 Upload All Events, 3–14
 Upload One Event, 3–14

V

Vertical Axis, 3–1



View Events, 3–12

W

Wall Installation, 4–1

Warning Alarm

 geo alarm level, 3–11

 mic alarm level, 3–11

Warranty. *See* the title page

Waveform Calculations, 4–10

Z

Zero Crossing Frequency (ZC Freq), 4–7

 calculating, 4–7

 limitation, 4–7

 sample rate error, 4–8

 sound pressure, 4–10