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Chapter 1 General Description

General Description

The Alpha-Seismite digital seismograph is a versatile, “easy to use” monitor for recording vibration effects from blasting and other shock or transient vibration sources. It is lightweight and portable for ease of use on-site. The monitor may be operated unattended for two months or more on its internal, rechargeable battery. Longer operating times may be obtained by using a small solar cell or an automobile battery.

The Alpha-Seismite has four channels of monitored data comprised of three ground motion channels and one acoustic channel. Measurements can be displayed or printed in either English (U.S.) or metric units, based upon the specifications of the user.

Several models are available, from a “Bargraph Only” version to a “Full Waveform” model with enough memory storage for 341 typical events. All models have a 40 character, two line display for ease of setup and quick viewing of summarized data. Each model allows automatic and/or on demand printing of a bargraph or waveform. Each model also features several data lines for the entry of user comments to describe a particular job or blast.

The Alpha-Seismite is sealed against dust and moisture to increase its operating life and reliability. All major components such as the sensors, printer, printed circuit boards and optional disk drive are interchangeable between units. This feature can help to reduce downtime if repairs are required.

The BARGRAPH MODE displays seismic and air pressure data in a bargraph format that represents the peak values recorded within a specified period. The data are stored in memory and can be reprinted at a later date. Summary data can be viewed on the display after monitoring has ceased. Additionally, the job in progress can be monitored at any time without waiting for a printout.

The “Full Waveform” models of the Alpha-Seismite are available in several configurations. The primary difference between the various models is in the amount of memory each unit has for storing full waveform events. The following table summarizes the available memory and approximate full waveform storage capability of each instrument version:

<u>Instrument Version</u>	<u>Available Memory</u>	<u>Approximate Storage Capability</u>
Alpha-Seismite 3	1/8M (128K)	20 to 30 Events
Alpha-Seismite 4	1/4M (256K)	50 to 75 Events
Alpha-Seismite 5	1/2M (512K)	150 to 250 Events
Alpha-Seismite 6	1.0M (1024K)	up to 341 Events

Full waveform data are compressed before being stored in memory. Thus, the storage capabilities of the Alpha-Seismite Versions 3 through 6 are approximate based on the amount of data compression obtained for each event. As long as a full waveform record is stored in memory, it can be printed as many times as needed with the use of a variety of print speeds and gain ranges. This instrument feature allows an operator to review a recording in considerable detail as often as needed.

Another outstanding feature of the Alpha-Seismite is its ability to continue to monitor and record events even while it is printing a previously recorded event. This capability, coupled with the unit’s ability to record multiple events, significantly reduces the possibility of missing a vibration recording.

Chapter 1. General Description

All Alpha-Seismite models include an RS-232 interface for downloading bargraph and waveform data to a computer directly or via a modem. Modems are available which allow the recorded data to be accessed worldwide. An efficient data compression routine allows data to be transmitted by modem several times faster than competing instruments. This feature can help to save time and reduce telephone expenses.

In addition to the extended memory options, an optional disk drive can be purchased for permanent data storage. This disk drive can be used in two configurations. It can be permanently connected so that events are saved to disk as they are obtained. It can also be used portably to download events from any number of Alpha-Seismite instruments.

Each of the full waveform versions of the Alpha-Seismite can print "Particle Velocity Versus Frequency" charts for the recorded data. These charts utilize the Office of Surface Mining (OSM) regulatory criteria from CFR 30 (1987)* and the United States Bureau of Mines (USBM) recommended criteria from Appendix B, of RI 8507 (1980).*

Complimentary, computer software for Windows 3.1 or 95/NT is available for use with the Alpha-Seismite. This software allows bargraph and full waveform data to be downloaded, analyzed and printed. White Industrial Seismology, Inc. also offers a variety of optional analysis functions that provide enhanced data processing capabilities for the Alpha-Seismite data.

***Literature Cited**

Office of Surface Mining Reclamation and Enforcement. U.S. Department of the Interior. 30 C.F.R. Sec. 816.67 and 817.67 (Revised July 1, 1987), pp. 273-274 and 308-309.

Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding. Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting. BuMines, RI 8507, 1980, pp. 73-74.

Chapter 2 Specifications

Data Recorded	One (1) acoustic and three (3) seismic channels.
Frequency Response	Two (2) to 250 Hz. (-3 dB points).
Transducer	Three (3) component velocity output. All units are interchangeable with accuracy within two percent.
Microphone	Ceramic element rated to at least 160 dB.
Memory	Solid state with all summary, setup and recorded data retained with power off. A lithium backup battery retains data if the primary power source fails.
Clock	A 24 hour clock maintains the date and time accurate to within one (1) minute per month even if the primary power fails.
Timer Mode	Allows an instrument to be active only during selected hours on a daily basis.
Display	Wide temperature LCD has two (2) lines, of 40 characters each, which help make setup easy and allow the operator to view operating parameters and summary data.
Keyboard	36 keys for power on and off, entering setup data, user comments and operating commands.
Power On Log	A log of the last 64 on/off cycles is kept in memory to indicate the active monitoring periods. If the timer is used, the log is updated each time it activates.
Printer	Thermal printer with 24 columns for text plus graphics capability. Paper take-up or tear-off operation is standard. The stationary print head and rugged mechanism require very little maintenance. The printer prints both text and graphics at high speed.
Chart Width	2.28 inches (5.8 centimeters).
Chart Length	82 feet (25 meters).
Battery	Internal 12 volt rechargeable.
Operating Time	With a fully charged battery all models will operate from two to four months at 1024 samples/sec. Longer times may be obtained using the Timer Mode or external power from a small solar cell or automobile battery.
External Battery Life	A standard automobile battery will keep the internal battery at full charge for several months at moderate temperatures. If the external battery fails, the unit will continue to operate on its

Chapter 2. Specifications

	internal battery.
Charging	An internal charging circuit allows charging with the supplied plug and wall mount charger or any 10 to 16 volt AC or DC supply. Power supplies for international use are available.
Operating Temperature	0 to 130 degrees F (-18 to 54 degrees C).
Case	Heavy gauge aluminum for effective electrical shielding and rugged protection.
Size	Approximately 16 in. X 11 in. X 6.5 in. (40.6 cm. X 27.9 cm. X 16.5 cm.).
Weight	Approximately 23 pounds (10.5 kg.) with all accessories.

Bargraph Mode

Header	The header prints when monitoring starts and contains the unit serial no., battery voltage, calibration status, start date and time, job number and recording ranges.
Comments	Up to six (6) lines of user comments may be entered from the keyboard for printing. These comments are also stored with each job in the event that printing is done later from memory.
Bargraph	Two sets of black bars representing the peak or resultant seismic and the peak acoustic level in dB are printed across the chart.
Summary	At user selected intervals, a summary of the seismic and acoustic activity is printed.
Ending Summary	When a job is ended by entering the inactive mode, an ending summary will print showing the highest peaks recorded for the job, the ending time and the ending battery voltage.
Power On Log	When the monitor is in the Inactive Mode, the power on log may be printed showing the times of the last 64 monitoring periods.
Sample Period	The highest peaks for the selected sample period are saved and printed as bars on the chart.
Stored Data	The highest peaks occurring in each period are stored in memory along with the summary and comments for the current job. The last 80 jobs are held in memory for printing anytime the unit is in the inactive mode.
Printer Ranges	User selected at the start of a job or prior to printing from memory from the inactive mode.
Seismic	Peak or Resultant 0.01 to 1.25 IPS 0.25 to 32 MMPS 0.02 to 2.50 IPS 0.5 to 64 MMPS

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	0.04 to 5.0 IPS	1.0 to 127 MMPS
	0.08 to 10 IPS	2.0 to 254 MMPS
Acoustic	106 - 138 dB, 110 - 142 dB, 116 - 148 dB.	

Waveform Mode

Waveform Data	Each full waveform signature is stored in solid state memory for up to 341 events, depending on the instrument model.	
Summary Data	Summarized data include the event time, date, battery voltage, peak measurements, unit serial number and frequencies. The summarized data are stored in solid state memory for the last 341 events.	
Sample Rate	1024 samples per second, per channel, including while printing. Options of 512, 256, 128, 64 and 32 samples per second, per channel, are available.	
Recording Units	English (U.S.) or metric.	
Recording Ranges		
Seismic	0.01 IPS to 5.12 IPS (130 MMPS). 0.02 IPS to 10.0 IPS (254 MMPS).	
Acoustic	0.02 to 2.56 millibars (100 to 142 decibels). 0.04 to 5.12 millibars (106 to 148 decibels).	
Trigger Levels		
Seismic	0.02 to 1.14 IPS (0.05 to 29 MMPS).	
Acoustic	106 to 142 dB or 112 to 148 dB.	
Frequency Response	2 to 250 hertz (-3 dB points).	
Record Duration	From one (1) to 12 seconds, at a sample rate of 1024 samples per second. At lower sample rates, the duration is automatically increased proportional to the amount of decrease in the sample rate.	
Records Stored	From 20 to 341 typical coal mine or quarry events depending on the instrument model.	
Calibration Test (Seismic)	A dynamic transducer test is performed automatically after each event or manually on command. The test results are stored in the summarized data and may be printed as an event.	
Calibration Test (Acoustic)	An electronic test of the microphone is performed with the seismic test and is stored in memory along with the seismic test.	
84 Hour Cal Test	In a remote installation, an automatic calibration test occurs if no event has been recorded for 84 hours.	

Chapter 2. Specifications

RS232 Serial Port	Data may be downloaded and setup commands may be uploaded directly by computer or remotely by modem. All components of an instrument, including the disk drive and printer, may be remotely controlled.
Baud Rate	From 300 to 9600.
Automatic Print	One or two copies may be printed immediately after an event is stored.
(P) PRINT Key	Allows the printing of any record in memory as many times as required, at different chart speeds and/or different trace amplitudes.
OSM/USBM Graph	Setup allows charts to be printed with or without this feature. The graph may be printed automatically with each record or manually for any record in memory or on disk.
Effective Chart Length	6 selections from 0.31 to 10.0 IPS (8 to 254 MMPS).
Print Time	Varies with record duration, chart speed and print options. Approximately five (5) to 10 seconds for a typical record.
Chart Length	Varies with the record time, chart speed and print options. Approximately 12 inches (30.5 centimeters) for a three (3) second record, without an OSM/USBM graph, at a medium chart speed.
No. of Records	Approximately 100 records per roll of paper at medium print speed.
Chart Ranges	Two (2) range options are available on the setup screen for acoustic and seismic to allow a wider range of recorded data.
Seismic Low Range	
5.0 IPS	Printer: 0.32, 0.64, 1.28, 2.56 and 5.12 IPS.
127 MMPS	Printer: 8, 16, 32, 65 and 130 MMPS.
Seismic High Range	
10.0 IPS	Printer: 0.64, 1.28, 2.56, 5.12, and 9.99 IPS.
254 MMPS	Printer: 16, 32, 64, 128 and 256 MMPS.
Acoustic Range	
142 dB Range	Printer: 0.64, 1.28, or 2.56 millibars. Auto ranged.
148 dB Range	Printer: 1.28, 2.56, or 5.12 millibars. Auto ranged.
Disk Drive	
General	The 3.5" high-density disk drive is available as an option to all

Chapter 2. Specifications

Alpha-Seismite models with the exception of the Model 1. The disk drive may be connected to an instrument for automatic storage of recorded events or it can be used portably to download and store events from multiple instruments.

Disk Type	3.5", 1.44 megabyte, high-density floppy.
Compatibility	Each disk must be formatted or reformatted on an Alpha-Seismite but is DOS compatible thereafter.
Storage Format	Events are stored using a proprietary compression routine to increase the number of events and allow faster reading, writing and downloading of events. A primary file is placed on side 1 of the disk and a backup file is saved on side 2 for greater reliability in retrieving data.
Number of Disk Events	As many as 158, three (3) to five (5) second events (each event stored twice on the disk).
Format	The disk is formatted specifically to setup a primary directory (EVENT.DAT) on one side and a backup directory (EVENT.BAK) on the other.
Write	Events may be written to disk automatically or all full waveform events in memory may be selected for downloading to disk.
Read	A disk directory, summary data for the events on disk and any full waveform event on disk may be accessed from disk and printed.
Cycle Time	A single event requires about five (5) seconds to read from or write to disk. Multiple event storage is faster, but varies with record duration.
Temperature	Operation temperature is typically from 40 degrees F to 110 degrees F (4 degrees C to 43 degrees C). A wider operating range is possible, but not as reliable.
Humidity	85 percent non-condensing.
Power Requirements	All operating power is derived from the instrument and has little effect on the operating life of the instrument in the automatic record mode.

Chapter 3 General Setup and Paper Installation

Instrument Setup

The “easy to use” Alpha-Seismite has many features that give its operator a variety of monitoring capabilities. After initial setup, operation can be as simple as connecting the sensors and pressing the ON Key.

Opening the Unit and Location of Sensors and Accessories

Open the latches on the handle-side of the case and lay back the cover. The accessories compartment is located along the left side of the case. This compartment contains the seismic sensor, microphone and other items. Lift the disk drive mounting plate to fully expose the compartment. If a disk drive is installed, handle it carefully to reduce any chance of damage. Remove the microphone holder, microphone, transducer, and peripheral items.

Installing the Microphone

Flip out the hinged microphone holder mount on the left side of the case. Screw the holder into the 1/2 inch, threaded hole. The holder will be free to move until the case lid is closed. The holder may be secured to the case with a short 6-32 screw if desired. If windy conditions are present, a windscreen should be placed over the mike. If rain is a possibility, use a windscreen and a loose plastic bag to protect the microphone from moisture. These accessory items are included in the compartment. Connect the microphone plug to one of the two connectors located in the interior of the compartment. Either connector will work.

Installing the Transducer

Connect the plug for the seismic sensor to the remaining connector. When coupled to the ground or other surface, the arrow on top of the sensor case should point in the direction of the blast area. Completed installation may consist of burial, surface spiking and sandbagging, or mounting on a buried spike. The recommended installation is to bury the transducer wherever possible. Eyeball leveling is adequate for proper operation.

Note: Mounting tape or grouting material may be used for installation on a hard flat surface such as a concrete slab.

Using AC Power or an External Battery

If an external battery or AC power is to be used, connect the plug from one of these sources to the nine pin connector on the inside of the accessories compartment. It is recommended that the plug be installed before connecting the auxiliary battery or plugging in the AC charger. Where permanent installations use external power, more reliable operation may be obtained by connecting the battery using a type of battery clamp which tightens with a bolt. Coating the terminals with grease may also help to control corrosion.

Note: Voltage fluctuations while using the AC charger during operation may cause false triggering or high readings under some circumstances. Tests should be made before this type of installation is used in critical applications.

Paper Installation

If possible, before installing the paper, use a vacuum cleaner to clean the dust and dirt out of the instrument, especially away from the chart door. Dust particles in the printer can cause the thermal head to lose contact with the paper and may also result in excessive head wear.

Chapter 3. General Setup and Paper Installation

Important Note: The best print results will be obtained if the chart paper is stored on end to prevent flattening. Spare rolls can be kept in the accessories pocket in their original plastic packages, but care should be taken to make certain that the paper will not be under any pressure which might deform it. The following instructions should be followed to properly install printer paper. The paper can be installed whether or not the instrument has been setup to operate as described previously.

- A. Open the printer cover by turning the knob at the right end of the cover. Raise the printer head by pushing the head lift lever forward. The head lift lever is located near the upper right corner of the printer.
- B. Remove the paper from its package and unroll a small amount.
- C. Insert the end of the paper under the printer platen. The paper must roll off the spool from the bottom, not the top. Using light pressure, push the paper around the platen until the end shows at the top. The paper roll may be rotated with the fingers of the left hand to move the paper around the platen.
- D. Remove the paper roll holder from the slots in the center of the printer. Insert the slotted holder into the center of the roll and carefully slide the paper roll into the support mechanism for the slotted holder. If the paper has been installed accurately, the slotted holder should fit firmly inside the holding mechanism.
- E. The printer can be used in either take-up or tear-off mode. To use the take-up mode, install the take-up roller spool by gently lifting the take-up assembly at the back of the printer and then sliding the spool over the bar. Then, gently lower the take-up assembly. Grasp the end of the paper and gently pull it until there is sufficient slack to install the paper on the take-up roller. It is important that the paper be essentially square with the spool axis. Tape the end of the paper to the take-up spool.

To use the tear-off mode, reverse the metal cover on top of the printer cover. Do this by removing the two screws, reversing the direction of the cover and then replacing the screws. At this point, it is only necessary to guide the paper through the slot in the front of the printer cover while closing the cover. The paper can be torn off by pulling it to the right across the paper slot cover. If this feature is used regularly, power can be conserved by uncoupling the take-up motor connector located beside the take-up mechanism.

Note: If the tear-off mode is not used, the cover should be rotated to cover the slot and prevent the entry of water and dust.

- F. Before closing the printer cover for either the take-up or tear-off mode, remember to move the printer head lift lever back toward the paper roll. Make certain that the head is all the way down for proper printing.
- G. The paper can be advanced by gently pulling on the paper or by pressing the O or PAPER FEED Key while the Setup Screens are visible on the display.

Keyboard Description

The keyboard has 36 keys. Many of these have several functions to allow entry of user comments and to simplify instrument setup and operation. Basic keyboard operation is the same in either the BARGRAPH MODE or WAVEFORM MODE. Some of the special function keys, however, are dedicated to the WAVEFORM MODE of operation.

The SHIFT Key is used to toggle the keyboard between the ALPHA and NUMERIC MODES. In the ALPHA MODE, the black characters are active. In the NUMERIC MODE, the red characters are active. The SHIFT Key is primarily useful for entering user comments. All setup functions may be accessed independently of the keyboard mode.

Note: If the instrument is on, but no keyboard entries are made for one or two minutes, the display will blank to conserve power. When the screen is blank, only the POWER, RESET AND ENTER Keys remain active. If ENTER is pressed, or a trigger is received, the screen will reactivate.

Chapter 3. General Setup and Paper Installation

ON Key

The ON Key is used to turn on the instrument after the mike and transducer have been connected. If at least one sensor is not installed, the unit will only turn on as long as the ON Key is depressed. This feature was included as a safety feature to insure that the unit will be off when it is not in use. If only instrument setup or data acquisition is required, just connecting the microphone will minimize the possibility of unwanted triggers.

OFF Key

The OFF Key is used to turn off power. There is a difference between the instrument being off and its being in the LOW POWER MODE where the unit is monitoring, but the display is blank. In the LOW POWER MODE, the Main Screen appears if the ENTER Key is pressed. When the instrument is turned off, the screen will remain blank when the ENTER Key is pressed. To help prevent accidentally turning the instrument off, the OFF Key must be held down for about two seconds before it takes effect.

If the instrument is in the LOW POWER MODE, the operator should first press the ENTER Key to activate the screen. The OFF Key should subsequently be pressed until the screen blanks. This will help the operator to confirm that the instrument is turned off.

RESET Key

The RESET Key is used in combination with other keys to perform special functions. Pressing the RESET Key by itself results in the same effect as turning the instrument off and back on. No data is lost by this action.

If the Timer is set to ON, and the unit is in a non-active period, pressing the RESET Key will activate the instrument. The seismograph will remain active until the next scheduled off hour.

CLEAR-RESET Keys

There is a remote chance that an instrument could experience problems while trying to analyze a corrupted event. Holding down the CLEAR Key and pressing the RESET Key will clear the working memory of the corrupted event and reset the instrument setup options to the default values. The CLEAR Key should be held down several seconds after the RESET Key is released. Refer to the BARGRAPH and WAVEFORM sections of this manual for information on their specific default values.

ENTER Key

When the screen is active, the ENTER Key can be pressed with the cursor at any location on the display. All visible options will be accepted as they currently appear on the screen and the next screen will appear for inspection. When the instrument is monitoring in the LOW POWER MODE, the ENTER Key can be used to activate the screen.

SELECT Key

The SELECT Key is used to control cursor movement in a screen. Each time the SELECT Key is pressed while a screen is active, the cursor will move to the next field available for modification. On the Main Screen, the SELECT Key is used to toggle between the summary and frequency display.

SHIFT Key

The SHIFT Key toggles the keyboard between the ALPHA and NUMERIC MODES. A single character at the lower left corner of the display indicates which mode is currently active. An "A" character represents the ALPHA MODE and an "N" character the NUMERIC MODE. In ALPHA MODE, the black letters are active. In NUMERIC MODE, the S or SPACE Key, and the red numbers are available for the entry of comments.

CLEAR (Help) Key

With the exception of the Comment Screens, the CLEAR (Help) Key, when used without the RESET Key, displays help information about the current screen.

Chapter 3. General Setup and Paper Installation

LEFT-ARROW or Decrement Key, RIGHT-ARROW or Increment Key

In most cases, changes to the setup fields can be made by simply decrementing or incrementing current values. The LEFT-ARROW Key is used to decrement values and the RIGHT-ARROW Key is used to increment values. Holding down an ARROW Key will cause a continuous update.

F or PRINT LOG Key

The F or PRINT LOG Key is used to print a log of the last 64 times the instrument power was turned on and off. The log may be initialized to zero by holding down the F Key when the instrument is turned on. To do this the F Key should be held for several seconds after power on.

O or PAPER FEED Key

The O or PAPER FEED Key is used to advance the paper. This key will function when the Main Screen or any Setup Screen is active.

P or PRINT Key

The P or PRINT Key is used to print an event or bargraph job from memory. When this key is pressed while on the Main Screen, the event being displayed will be printed. All events in memory can be previewed on the display prior to printing. On units with a disk drive, the PRINT Key can also be used to print summary or waveform data that are read from disk.

G or PRINT GRAPH Key

The G or PRINT GRAPH Key is only available in the WAVEFORM MODE. This key is used to print an OSM/USBM graph of the full waveform event currently displayed on the screen.

Note: A valid printout can only be produced if the full waveform for an event is still in memory. An "A" (analog waveform) character at the lower right corner of the Main Screen indicates that an event is in memory. An "S" character indicates that only summary data are available.

Q or QUIT PRINT Key

The Q or QUIT PRINT Key can only be used in the WAVEFORM MODE. The key is used to prematurely stop the printing of a record after the graphics portion of the record is reached.

Q-RESET Keys

The Q-RESET Key combination can only be used in the WAVEFORM MODE. This key combination resets the seismic and acoustic trigger levels to their maximum values. This function would be useful in the event that background noise would be causing continuous triggering. Holding down the Q Key and pressing the RESET Key will set the seismic trigger to 1.14 IPS and the acoustic trigger to OFF.

R or DISK MENU Key

Pressing the R or DISK MENU Key, activates a screen for the setup and use of the optional disk drive. To use the R Key, the disk drive must be set to ON in the Setup Screens and a formatted disk must be installed in the drive.

T or CAL TEST Key

The T or CAL TEST Key is available only in the WAVEFORM MODE. This key is used to conduct an internal calibration test on the seismic and acoustic sensors. The results of the calibration test will be printed automatically if the instrument is setup to print copies of each event.

U or TRIG Key

The U or TRIG Key is available only in the WAVEFORM MODE. The purpose of this key is to place the instrument in a MANUAL TRIGGER MODE.

Chapter 3. General Setup and Paper Installation

The MANUAL TRIGGER MODE can be entered in two ways. If the instrument is off, holding down the TRIG Key while simultaneously turning on the power will place the instrument in the MANUAL TRIGGER MODE. If the screen is active, holding down the TRIG Key and then pressing the RESET Key will also activate this mode. The U Key should be held down until the display indicates MANUAL MODE. In the MANUAL MODE, the instrument will only trigger when the TRIG Key is pressed. The duration of the recording will be determined by the current setup value for the record duration.

B Key

The B Key is used to toggle an instrument between the WAVEFORM and BARGRAPH MODES of operation. This key will not function in an Alpha-Seismite Model 1, which has no full waveform capability. In an instrument with full waveform capability, the BARGRAPH MODE is entered by holding down the B Key while turning the power on. This mode can also be activated when the screen is active by holding down the B Key and pressing the RESET Key. The B Key should be held down until the display indicates the OPERATING MODE. Each time power is cycled, the instrument will default to the mode which was last used.

Note: Switching between the WAVEFORM and BARGRAPH MODES will clear an instrument's memory of all stored events and setup information.

Chapter 4 Bargraph Mode

To use the BARGRAPH MODE, the operator should install the transducer and mike as described previously. If the instrument is a "Bargraph Only" model, press the ON Key to turn on the power.

If the instrument is in the WAVEFORM MODE upon power up, the B and RESET Keys can be used to change to the BARGRAPH MODE. Press and hold the B Key and then press the RESET Key. Continue to hold down the B Key until the following message appears on the screen:

BARGRAPH mode destroys WAVEFORM data N key to abort, ENTER key to continue

If the N Key is not pressed, in a few moments the instrument will enter the BARGRAPH MODE and any waveform data in memory will be erased. The B and RESET Key combination will only function on Alpha-Seismite Model 3 instruments and higher.

Note: It is important to reiterate that placing an instrument in the BARGRAPH MODE will clear the instrument's memory of all waveform events and setup information.

When the BARGRAPH MODE is accessed, the Stabilization Screen will appear on the display with the last calibration date on the first line. This date serves as a reminder to have the calibration certified at least once each year. The unit serial number and software version will also appear on this screen.

If the seismograph also has a WAVEFORM MODE, a message will appear to warn the user that any waveform data in memory will be erased. Otherwise, the message "BARGRAPH SELECTED" will appear on the instrument's display, and a count will commence at the lower left corner of the screen. In a few moments, this screen will disappear and Setup Screen # 1 will appear.

If previous bargraph setup data are in memory, and the data are setup as needed, it will only be necessary to press the ENTER Key to display Setup Screen #2. If this is the case, to begin a job, increment the System Field in Setup Screen #3 to ACTIVE and press the ENTER Key. To end a job, and print an ending summary, make the System Field value INACTIVE and press the ENTER Key. If the instrument is left on, and no entries or key presses are made for approximately one minute, the seismograph will default to ACTIVE and a new job will begin.

Setup Screen #1

Setup Screen #1 will be similar to the following example:

```
REPORT 0.1 HR SPACES OFF COMMENTS OFF
A BAT 12.6 TIMER OFF 04-1-97 13:16
```

The cursor will be blinking in the lower right corner of the screen. It can be moved to any changeable field by pressing the SELECT Key. The Increment (LEFT-ARROW) and Decrement (RIGHT-ARROW) Keys can be used to change the values of the selected fields as required. Pressing the ENTER Key will cause the seismograph to accept all displayed field values and the screen will update to the next setup screen.

The displayed battery voltage represents the current voltage. The battery should be above 12 volts for proper operation.

The field values that can be selected for modification are:

Chapter 4. Bargraph Mode

Report Field

This field value represents the length of time between summary printouts on the chart. It does not represent the amount of time between printed bars. The lowest value is 0.1 HR. This value means that every six minutes the unit will print a summary showing the largest measurements obtained during the last six minutes. Depending on the interval setting (Setup Screen #2), there will be a number of bars printed between the summary reports.

Spaces Field

The Spaces Field can have a value of ON or OFF. Selecting ON as the response to this field will instruct the printer to insert spaces between bars on the chart to make it more easily read. This will, however, use more paper for each chart. A field value of OFF will cause bars to be printed with no spaces between them.

Comments Field

The value for the Comments Field may be ON, OFF or ADD. Pressing the ENTER Key with a field value of ADD will display the first of five user Comment Screens. The black, keyboard letters are available to enter comments as long as an "A" (ALPHA MODE) character is present at the lower left corner of the display. Pressing the SHIFT Key will change this character to an "N" (NUMERIC MODE). The NUMERIC MODE enables the red numbers and the S or SPACE Key. The S Key can be used to place a space at the current cursor location.

Although each comment screen can accept as many as 40 characters, the printer is limited to 24 characters on a line. If a line contains more than 24 characters, the printer will automatically wrap the remaining characters to the next line.

After the last Comment Screen has been edited, Setup Screen #1 will be displayed with a value of ON in the Comments Field. When the value for the Comments Field is ON, the printer will automatically print the entered comments. If OFF is selected as the value for the Comments Field, any entered comments will not be printed. The comments will, however, be retained in memory. The only advantage in selecting a field value of OFF is that less paper will be used in the printout.

Timer Field

This field allows the timer function to be SET, turned ON or turned OFF. If the field value is specified as SET, a new screen will appear to allow the timer operation to be programmed by the operator. This screen will be similar to the following:

TIME TO TURN UNIT OFF[00] ON 00 arrow keys to set hour 0-23, then enter
--

The brackets and cursor will initially be on the OFF Field. The ARROW Keys can be used to change the field value in order to set the hour at which the unit will cease actively monitoring on a daily basis. When the ENTER Key is pressed, the off hour will be set and the cursor and brackets will advance to the ON Field.

In the same manner as the OFF Field, the ON Field can be used to set the hour at which the unit will start monitoring on a daily basis. This value must be at least one hour prior to the value for the OFF hour.

If the ON and OFF times are set to the same hour, the Timer will not function. Press the ENTER Key to accept the ON Field value and return to Setup Screen #1.

As an example, assume that the OFF field value is set as 17 and the ON field value is 07. These values indicate that the instrument will cease actively monitoring at 5:00 PM and begin monitoring at 7:00 AM, on a daily basis. In other words, the instrument will only actively monitor events between 7:00 AM and 5:00 PM.

Chapter 4. Bargraph Mode

Date and Time Fields

These fields show the current instrument date and time. The SELECT Key can be used to access the date and time parameters that can be modified. The INCREMENT and DECREMENT Keys can be used to change the field values.

Setup Screen #2

Setup Screen #2 is displayed whenever the ENTER Key is pressed from Setup Screen #1. This screen will be similar to the following example:

AIR RANGE 110 - 142	SEIS RANGE IPS 1.2
A PRINTER PEAK	INTERVAL 10 SEC

Air Range Field

Three airblast recording ranges are available. The information shown in the preceding illustration covers the range from 110 dB to 142 dB. In this range, airblast levels at or below 110 dB will not be visible on the bargraph chart. The summary printout, however, can show levels as low as 94 dB. Airblast levels above 142 dB cannot be resolved by the instrument and will be recorded and stored in memory as 142 dB.

The lowest airblast range is from 106 to 138 dB. In this range, airblast levels at or below 106 dB will not be visible on the bargraph chart. The summary printout, however, can show levels as low as 94 dB. Airblast levels above 138 dB cannot be resolved by the instrument and will be recorded and stored in memory as 138 dB.

The highest airblast range is from 116 to 148 dB. In this range, airblast levels at or below 116 dB will not be visible on the bargraph chart. The summary printout, however, can show levels as low as 100 dB. Airblast levels above 148 dB cannot be resolved by the instrument and will be recorded and stored in memory as 148 dB.

Seis Range Units Field

The IPS (inches per second) designation on the preceding Setup Screen #2 sample indicates that the seismic data units will be inches per second. This field may also be set to MMPS (millimeters per second). Data stored in the instrument's memory will not be affected by this setting. Printing from memory may be done in IPS or MMPS at any time.

Seis Range Field

Four seismic ranges are available. Each range can be displayed and printed in IPS (inches per second) or MMPS (millimeters per second). The lowest range has an upper limit of 1.2 IPS (31 MMPS), in increments of 0.01 IPS (0.254 MMPS). The resolution on the three lowest ranges is 0.01 IPS (0.254 MMPS). The summary printout for the three lowest ranges can print values from 0.01 IPS (.254 MMPS) to 5.12 IPS (130 MMPS).

The highest range, 10 IPS (254 MMPS), should not be used unless particle velocity levels above 5.0 IPS (127 MMPS) are expected. The lowest level that can be shown on the chart is 0.08 IPS (2.0 MMPS). The summary printouts can show levels between 0.02 IPS (5.08 MMPS) and 10.0 IPS (254 MMPS).

Printer Field

The Printer Field value can be set to OFF, PEAK or RESULT. If the printer is set to OFF, automatic printing of a bargraph chart will not occur. Bargraph printouts will have to be produced from data stored in the instrument's memory.

A Printer Field value of PEAK will instruct the instrument to print bargraph values in terms of the peak particle velocity of ground motion. A Printer Field value of RESULT will instruct the instrument to print bargraph values in terms of the ground motion resultant or vector sum.

Chapter 4. Bargraph Mode

Interval Field

The Interval Field sets the time between printed bars. The printer, however, prints the bars at six times the Interval value. In the above example, the interval between bars would be 10 seconds. The printer would print six bars every 60 seconds. value can be set to OFF, PEAK or RESULT. If the printer is set to OFF, automatic printing of a bargraph chart will not occur. Bargraph printouts will have to be produced from data stored in the instrument's memory.

Setup Screen #3

Setup Screen #3 is displayed whenever the ENTER Key is pressed from Setup Screen #2. This screen will be similar to the following example:

```
SYSTEM INACTIVE
```

System Field

The value for the System Field will default to INACTIVE (not monitoring) at power on. When ACTIVE is selected for the System Field and the ENTER Key is pressed, the instrument will begin to monitor using the selected parameters. If no keyboard action takes place for approximately one minute, the system will default to the ACTIVE mode as a protection against the operator forgetting to start the active mode.

When the System Field value is INACTIVE, and the ENTER Key is pressed, the current monitoring job will end and the footer summary for the job will be printed on the chart. Once the unit is placed in the ACTIVE MODE, it will remain active until power is turned off or the TIMER MODE turns it off for a selected period of time. In continuous operation, a new job will start at midnight and the unit will remain active.

Note: If power is removed before INACTIVE is selected, the ending summary will not print and any data that had not printed will be lost. If the instrument is again powered on in the BARGRAPH MODE, it will default to ACTIVE and immediately start a new job.

Screen #4

After the ACTIVE SYSTEM MODE has been entered, the bargraph header will be printed on the chart and Screen #4 will appear on the instrument display. This screen will be similar to the following:

```
BAT 12.5 04-01-97 13:21 IPS 003  
4 AIR 110 DB 15:02 SEIS 00.96 15:08
```

Screen #4 is not a Setup Screen. Instead, this screen displays pertinent monitoring information. The number four in the lower left corner of the display identifies the screen number. The battery voltage, date and time shown on the first line are relative to the start of the current job. The IPS indicates that the peak readings are to be printed and displayed in inches per second. As was previously discussed, the printed units can be selected from Setup Screen #2. The number at the upper right corner of the display represents the current job number. This number is both printed on the chart and stored in memory with the bargraph data.

This second line displays the peak levels obtained since the start of the monitoring period. The text "AIR 110 DB 15:02" means that the largest acoustic level recorded has been 110 decibels at a time of 15:02. The text "SEIS 00.96 15:08" means that the largest seismic level recorded has been 0.96 inch per second at a time of 15:08. The type of value displayed for SEIS will depend on what was specified for the PRINTER Field in Setup Screen #2. If the PRINTER Field value is specified as PEAK, the SEIS value will be peak particle velocity. If the PRINTER Field value is RESULT, the SEIS value will be the peak vector sum.

Chapter 4. Bargraph Mode

Screen #5

If the SELECT Key is pressed from Screen #4, Screen #5 will be displayed. This screen will be similar to the following:

```
BAT 12.5 04-01-97 13:40 IPS 006
5 AIR 100 DB 15:40 SEIS 00.16 15:40
```

Screen #5 is similar to Screen #4 except this screen shows the peak measurements for the current bar interval, not the monitoring period. Since we have an INTERVAL value of 10 seconds, this screen will update every 10 seconds. The number five in the lower left corner of the display identifies the screen number.

Screen #4 - Printing Bargraph Data From Memory

Bargraph data are stored in the instrument's memory in a compressed format. These data can be manually printed as long as the unit's MONITORING MODE is set as INACTIVE. As previously mentioned, the INACTIVE MONITORING MODE may be selected from Setup Screen #3.

If the ENTER Key is pressed from Setup Screen #3 while the System Field value is INACTIVE, Screen #4 will appear. Screen #4 is an Information Screen that can be used to display or print pertinent data for any bargraph event in the instrument's memory. Screen #4 will be similar to the following:

```
BAT 12.5 04-01-97 15:59 IPS 006
4 AIR 110 DB 15:02 SEIS 00.96 15:08
```

The format of Screen #4 was described previously. This screen shows the peak bargraph data for the displayed job. In the above example we are looking at Job 006. Other job numbers in memory may be viewed and/or printed by incrementing or decrementing this number.

Once bargraph data are placed in memory, they are compressed to samples at six times the original setting for the INTERVAL value. Since we were using an INTERVAL of 10 seconds, the bargraph data stored in memory are in one minute intervals.

The PRINT or P Key can be pressed to produce a printed bargraph record of the displayed event. The printout will conform to the setup parameters that were established in Setup Screens #1 and #2. The setup values can be changed at any time to produce different printouts.

Default Setup Parameters

When the memory is cleared, or the BARGRAPH MODE is entered after the seismograph was previously used in WAVEFORM MODE, all setup parameters will be set to default values. These values are:

Date/Time: Unchanged	Air range: 110-142	Seis range: 0.05 IPS
Report: None	Timer: Off	Printer: Peak
Comments: Off	System: Inactive	Spaces: Off

Chapter 5 **Waveform Mode**

Introduction

To use the Alpha-Seismite WAVEFORM MODE, install the transducer and mike as described previously in Chapter 3. Then press the ON Key. The Last Calibration Date will appear on the display to serve as a reminder to have the instrument's calibration certified annually.

If the instrument is in the BARGRAPH MODE upon power up, the B and RESET Keys can be used to change to the WAVEFORM MODE. To do this, press and hold the B Key and then press the RESET Key. Continue to hold down the B Key until the following message appears on the screen:

WAVEFORM mode destroys BARGRAPH data N key to abort, ENTER key to continue

If the N Key is not pressed, in a few moments the instrument will enter the WAVEFORM MODE and any bargraph data in memory will be erased. The B and RESET Key combination will only function on Alpha-Seismite Models 3 through 6.

After entering the WAVEFORM MODE, a count will begin at the lower left of the display. This count will indicate that the WAVEFORM MODE setup procedure has started. At this point, if the instrument contains an optional disk drive, and the drive was previously setup for automatic operation, the drive will power up and be tested.

When using a disk drive, if the drive is not ready or if a disk is not installed, error messages may appear on the display. If this occurs, the operator should either attempt to correct the error or turn the drive off. Pressing any key at a disk error message will exit the display. If no action is taken by the operator, the display will exit automatically in a few seconds.

After the initial setup procedure is completed, the Stabilization Screen will appear. During stabilization, the bottom line of the screen will indicate the software version, the instrument identification number and the amount of memory installed. A continuous numerical count can be observed at the upper right corner of the display. If the count starts over at zero numerous times, this may indicate that background noise is above the monitor's trigger levels. If this is the case, the operator should press and hold the Q or QUIT Key and then press the RESET Key. This key combination will set the seismic trigger level to maximum and the acoustic trigger to OFF. Instrument stabilization should subsequently occur in a few seconds.

Note: Immediately after the instrument stabilizes, the Alpha-Seismite will be in the WAVEFORM MODE. The instrument will utilize the same setup parameters as the last time the unit was used. This feature can help insure that an event will be recorded, even if the operator is currently engaged in setting up the instrument.

Setup Screen #1

After instrument stabilization is complete, Setup Screen #1 will appear. This screen will be similar to the following:

BAT 13.0	BAUD 9600	WRAP ON	DISK OFF
A COMMENTS ON	AIR DB	4-01-97	14:20

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Setup Screen #1 contains information about the current status of the monitor's battery voltage, baud rate, wrap setting, disk drive, comments, acoustic units, date and time. The cursor will be blinking in the lower right corner and can be moved to any changeable field by pressing the SELECT Key. The INCREMENT or DECREMENT Keys will allow an operator to change the value for the selected field. The ENTER Key can be used to accept all displayed field values.

BAT Field

The BAT field shows the current battery voltage. The voltage should be above 12.0 volts to insure proper operation.

Baud Field

The baud rate may be set to a value of 300, 600, 1200, 2400, 4800 or 9600. This field value is used to match communication rates for downloading data to a computer through the nine pin serial connector. The value for the baud rate is inconsequential unless the operator will be downloading data.

Disk Field

If the instrument is equipped with an optional disk drive, the disk field may be set to ON to automatically record events on disk as they occur. Setting this field to OFF will turn off the automatic disk storage. The Disk settings are discussed in detail later in this chapter.

Note: If a formatted disk is not installed in the drive, or if a drive is not connected to the instrument, the Disk Field should be set to OFF so the unit will not test for an operating drive each time an event occurs.

Comments Field

As many as six lines of comments can be saved with each event. If the value for this field is OFF, no comments will be saved. If the field value is ON, the current comments will be saved to memory with each event. If a field value of ADD is specified, when the ENTER Key is pressed, the first of the six Comment Screens will appear. When comments are saved, each record is increased in size by 240 bytes and therefore fewer events may be stored in memory.

The Comment Screens are accessible from Setup Screen #1 by pressing the ENTER Key after selecting ADD in the Comments Field. These screens allow the user to enter as many as six lines of information. The first four screens have suggested uses on the bottom display line. These screens can be used, however, to input any information.

Cursor control is maintained with the DECREMENT and INCREMENT Keys. From the initial cursor position, pressing the DECREMENT Key will erase all data on the line. The ENTER Key can be pressed at any point on the line to go to the next screen.

When an "A" (ALPHA MODE) character is showing at the lower left corner of the screen, all letters are available for data entry at the position of the cursor. The SHIFT Key can be used to toggle the "A" to "N" (NUMERIC MODE) and allow any numbers to be entered as comments. In the NUMERIC MODE, the S or SPACE Key can be used to erase a character and leave a blank space on the screen.

When the ENTER Key is pressed at the last Comment Screen, Setup Screen #1 will reappear with a value of ON in the Comments Field. Normally, this is the desired default.

Note: The Comment Screens are active during monitoring. If an event occurs while the operator is using a Comment Screen, the event will not be processed until the Comment Screens are exited. The Comment Screens can be exited by pressing the ENTER Key. The screens will automatically be exited if no key action occurs within one or two minutes.

Chapter 5. Waveform Mode

Date and Time Fields

The current date and time can be modified using the INCREMENT or DECREMENT Keys. The Date Fields that can be modified include the Month, Day and Year. The Time Fields include the Hour and Minute.

Setup Screen #2

When the ENTER Key is pressed from Setup Screen #1 (except when adding comments), Setup Screen #2 will appear. This screen will be similar to the following example:

COPIES 1	MAX RANGES	IPS 05.0	DB 142
TRIGGERS	SEIS 0.05	IPS	AIR OFF DB

Setup Screen #2 contains information about the current status of the number of copies to be printed, the maximum recording range of the instrument, the seismic trigger level and the acoustic trigger level. When Setup Screen #2 appears, the cursor will be blinking at the lower right corner of the display. The cursor can be moved to any changeable field by using the SELECT Key. The INCREMENT or DECREMENT Keys can be used to change the value for the selected field.

Copies Field

The value entered in the Copies Field will determine the number of copies that will automatically be printed when an event is obtained. Field values are 0, 1 and 2 copies. If 0 copies is entered, automatic printing will not occur.

Max Ranges Units Field

The Units Field follows the MAX RANGES text. The value specified in this field will determine the units in which the particle velocity levels will be presented on the chart and display. Either IPS (inches per second) or MMPS (millimeters per second) can be specified as a value for this field.

Max Ranges Value Fields

These fields allow an operator to modify the maximum recording ranges for both the seismic and acoustic data. With this feature, a wider range of data may be obtained.

The two ranges to record seismic data are 5.0 IPS (127 MMPS) and 10.0 IPS (254 MMPS). If you expect to obtain levels exceeding 5.0 IPS (127 MMPS), you should use the 10.0 IPS (254 MMPS) range. With the 5.0 IPS range, the data resolution is 0.01 IPS (0.25 MMPS). In the 10.0 IPS range, the data resolution is 0.02 IPS (0.50 MMPS).

The two acoustic ranges are 142 dB or 148 dB. As with the seismic ranges, the 148 dB range allows the recording of higher airblast overpressure amplitudes than the 142 dB range, but at half the resolution.

Seismic Trigger Field

Values for the Seismic Trigger Field in the 5.0 IPS range setting are from 0.02 to 1.14 IPS (0.50 to 28.9 MMPS). In the 10.0 IPS range setting, the minimum trigger level is 0.04 IPS (1.0 MMPS).

Acoustic Trigger Field

Values for this field in the 142 dB range setting are from 106 to 142 dB. In the 148 dB range, the values can be from 112 to 148 dB. The field value can also be set to OFF, if no acoustic trigger is required.

Setup Screen #3

When the ENTER Key is pressed from Setup Screen #2, Setup Screen #3 will appear. This screen will be similar to the following example:

Chapter 5. Waveform Mode

PRINTER RANGE 0 SPEED 1 TIMER OFF
A 1024 SEC 003 SEC RECORD OSM NONE

This screen contains information about the current status of the printer range, printer speed, timer function, sample rate, record duration and the OSM/USBM Graph function.

Printer Range Field

Values for this field range from 0 to 5. When the field value is set at 0, the printer will automatically use the best range to present the printed data based on the highest peak recorded. This setting will normally be the only one required. However, in a situation where it is desirable to print on a fixed range, the other field values from 1 to 5 may be used. The full scale chart ranges and scale factors for the 5.0 IPS range are as follows:

<u>Range</u>	<u>Largest Amplitude</u>		<u>Scale Factor</u>	
	<u>IPS</u>	<u>MMPS</u>	<u>IPS/DIV</u>	<u>MMPS/DIV</u>
1	0.32	8.1	0.08	2.0
2	0.64	16.3	0.16	4.0
3	1.28	32.5	0.32	8.1
4	2.56	65.0	0.64	16.3
5	5.12	130.0	1.28	32.5

The above values are doubled when using the 10.0 IPS (254 MMPS) range.

Printer Speed Field

The possible values for this field range from 1 to 6. The value entered in this field controls the amount of paper that is used to print an event. At a speed value of 1, the least amount of paper will be used and very little of the waveform details will be visible. Printer speeds are related to chart length. The table shown below illustrates a few relationships between the speed and the chart length. All calculations are based on a sample rate of 1024 samples per second with no OSM graph.

<u>RECORD TIME</u>	<u>SPEED 1</u>	<u>SPEED 2</u>	<u>SPEED 3</u>	<u>SPEED 4</u>	<u>SPEED 5</u>	<u>SPEED 6</u>
1 Second	5.1 in. 13.0 cm.	5.5 in. 14.0 cm.	6.7 in. 17.0 cm.	8.7 in. 22.1 cm.	12.0 in. 30.5 cm.	20.0 in. 50.8 cm.
2 Seconds	5.5 in. 14.0 cm.	6.3 in. 16.0 cm.	7.9 in. 20.1 cm.	11.0 in. 27.9 cm.	17.0 in. 43.2 cm.	29.5 in. 74.9 cm.
8 Seconds	7.1 in. 18.0 cm.	9.9 in. 25.1 cm.	15.3 in. 38.9 cm.	26.0 in. 66.0 cm.	47.2 in. 120 cm.	89.7 in. 228 cm.

Timer Field

This field allows the timer function to be SET, turned ON or turned OFF. If SET is specified in this field, when the ENTER or SELECT Key is pressed, a new screen will appear. This screen will allow the timer operation to be programmed. The screen will be similar to the following example:

TIME TO TURN UNIT OFF[00] ON 00
arrow keys to set hour 0-23, then enter

The brackets and cursor will initially be in the OFF field. The INCREMENT and DECREMENT Keys will allow the operator to set the hour when the unit will cease monitoring on a daily basis. When the ENTER Key is pressed, the OFF hour will be set and the cursor and brackets will advance to the ON Field. The ON time must be set at least one hour earlier than the OFF Time. The primary purpose for timer operation is to

Chapter 5. Waveform Mode

conserve power for longer instrument operation per battery charge. During time periods outside the set timer range, the instrument will not record events.

Sample Rate Field

The Sample Rate Field may be set at 1024, 512, 256, 128, 64 or 32 samples per second. If this field is changed, the value in the Duration Field will also change. Each time the sample rate is halved, the duration will double. The sample rate defines the frequency and amplitude resolution of the record and also determines the maximum available recording duration. The highest frequency at which amplitude resolution is considered adequate is based on a minimum of 5 samples per cycle. The following table shows the effect of the sample rate on the maximum frequency for amplitude resolution:

<u>Sample Rate Per Second Per Channel</u>	<u>Maximum Frequency (Hz)</u>	<u>Maximum Record Duration</u>
1024	204.8	12 Seconds
512	102.4	24 Seconds
256	51.2	48 Seconds
128	25.6	96 Seconds
64	12.8	192 Seconds
32	6.4	364 Seconds

Note: IF ALLOWED, a lower sample rate can save memory space, extend battery life, and increase the duration of a record. However, unless the operator clearly understands the consequences of using a lower sample rate, this operating parameter should always be set at 1024 samples per second.

Duration Field

The instrument's recording duration can be set from 1 to 12 seconds at a sample rate of 1024 samples per second. This time should be set for the shortest time which will allow the instrument to record both the ground vibration and the airblast. When the optional disk drive is not enabled, the Alpha-Seismite is able to obtain a second recording while the previous one is being processed or printed. There is a 12 second, unprocessed record limitation to this feature. Two consecutive events, each four seconds in duration, can be recorded and processed.

If the vibration effects from an event continue above the trigger level after the set duration, the monitor will automatically record another event. Since there is a 512 sample pre-trigger, the pre-trigger data for the second event will include the dynamic calibration of the previous event. Thus, the second recorded event will have a superimposed 50 millisecond cal pulse included in its pre-trigger data.

OSM Field

Each full waveform version of the Alpha-Seismite instrument can automatically print "Particle Velocity Versus Frequency" charts for the recorded data. These charts utilize the Office of Surface Mining (OSM) regulatory criteria from CFR 30 (1987)* and the United States Bureau of Mines (USBM) recommended criteria from Appendix B, of RI 8507 (1980)*.

The values for the OSM field can be NONE, SEPARATE or COMBINED. The value can be modified with the DECREMENT or INCREMENT Keys. When the field value is SEPARATE, each time a record is printed, the instrument will automatically print a separate OSM/USBM Graph for each of the three seismic components. When the field value is COMBINED, each time a record is printed, the instrument will automatically print an OSM/USBM Graph that combines the three seismic components. No OSM/USBM Graph will be printed if the field value is NONE.

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OSM/USBM Graphs can also be manually printed for any event in memory by pressing the G or PRINT GRAPH Key.

*Literature Cited

Office of Surface Mining Reclamation and Enforcement. U.S. Department of the Interior. 30 C.F.R. Sec. 816.67 and 817.67 (Revised July 1, 1987), pp. 273-274 and 308-309.

Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding. Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting. BuMines, RI 8507, 1980, pp. 73-74.

Main Screen

The Main Screen is accessed by pressing the ENTER Key from Setup Screen #3. It will also appear each time the screen is activated from the LOW POWER MODE in response to an event or when the ENTER Key is pressed. The Main Screen displays data about the current event or an event in memory. The format is similar to the following example:

BAT 13.0 04-01-97 15:51 IPS 041 P
00.56T 00.78V 00.64R 120A 00.88VS A

The information depicted on the Main Screen relates to the event number shown on the display, in this case event 041. The data shown on the first line are: the battery voltage at the time of the event (13.0); the event date (04-01-97) and time (15:51); the units (IPS); event number in memory (041); and the calibration status, either P (Pass) or F (Fail).

The second line of this screen contains the peak transverse (0.56), vertical (0.78) and radial (0.64) measurements in IPS or MMPS, the peak acoustic measurement in decibels (120), and the peak vector sum amplitude (0.88) in IPS or MMPS.

The letter "A" in the lower right corner indicates that the waveform information for the event is in memory. If this letter is "S", only the summary information is available. An "S" would indicate that the waveform data were overwritten.

The summary information for any event in memory can be displayed by using the DECREMENT and INCREMENT Keys to change the event counter. Alternatively, the operator can insert the desired event number by typing it directly from the numeric keypad. When an event number is selected, the display will show pertinent summary data for the selected event. The event may be printed by pressing the PRINT Key.

Note: The event number display will always default to the next available event number whenever a new event occurs.

Frequency Screen

The SELECT Key can be used to toggle between the Main Screen and the Frequency Screen. When the SELECT Key is pressed from the Main Screen, the Frequency Screen will appear. It will be similar to the following example:

T	V	R	A	041	P
N	022.2HZ	034.1HZ	013.1HZ	017.5HZ	A

The information depicted on the Frequency Screen relates to the event number shown on the display, in this case event 041. The second line of this screen displays the frequency at the peak amplitude of each component. In the example shown above the peak frequencies are Transverse (22.2Hz), Vertical (34.1Hz),

Chapter 5. Waveform Mode

Radial (13.1Hz) and Acoustic (17.5Hz). The letter "P" at the upper right of the display, and the letter "A" at the lower right of the display are as described for the Main Screen.

If an event is recorded while the instrument's display is on, a message will appear on the screen similar to the following:

DATA STORAGE IN PROGRESS
DO NOT TURN OFF POWER

A few seconds will be required for the data to be compressed and stored in memory. In a few moments, the Main Screen will reappear. The displayed data will pertain to the new event.

Warning: Pressing RESET or OFF while the above message is displayed may result in lost or corrupted data.

Default Setup Parameters

When the memory is cleared, or if the BARGRAPH MODE was used previously, the instrument will default to the following setup parameters:

Baud: 9600	Air Trigger: OFF	Disk: OFF	Printer Range: 0
Comments: OFF	Printer Speed: 1	Copies: OFF	Timer: OFF
Max Seis Range: 5.0 IPS	Samples/Sec: 1024	Max Acoustic: 142 dB	Record Time: 1 Sec
Seis Trigger: 0.05 IPS	OSM Chart: OFF		

Command Functions

Command functions such as PRINT, PRINT GRAPH, PRINT LOG, DISK MENU, PAPER FEED and CAL TEST are available from the Main Screen with a single keystroke. Each of these commands, with the exception of the DISK MENU, do not inhibit monitoring. If a Disk Format, Read or Write is in progress, the unit cannot trigger to an event.

Most of these commands were discussed in Chapter 3 of this manual. However, some of these may require additional explanation.

Calibration Test (TEST)

A dynamic calibration test can be performed at any time the monitor's Main Screen is visible and the transducer and microphone are connected. Pressing the T or CAL TEST Key will initiate an internal calibration check and the event number will update to a new number. A dynamic calibration test takes only 50 milliseconds of time, so there is little chance of a blast occurring simultaneously.

The calibration test level occurs at approximately 0.50 IPS (12.7 MMPS) on the seismic channels and approximately 134 decibels on the acoustic channel. The Alpha-Seismiter analyzes the test from peak to peak to minimize the effect of possible background noise. Consistent "F" or Fail indications on the display during calibration tests will require that the instrument's calibration be checked by qualified personnel.

Manual Trigger (TRIG)

In situations where the background vibration may cause continual triggering, or the operator wants to initiate a trigger manually, the MANUAL TRIGGER MODE may be useful. To use this mode, hold down the U or TRIG Key and tap the RESET Key. In the MANUAL TRIGGER MODE, the instrument will not trigger automatically. The unit can be manually triggered by pressing the TRIG Key. When triggered, the instrument will record for the time duration selected during setup.

Chapter 5. Waveform Mode

Manual Printing (PRINT)

It is very easy to manually print any event stored in the instrument's memory. An event cannot be printed, however, unless it still exists in memory as indicated by an "A" character at the lower right of the screen. An "S" in this location indicates that only summary data may be printed.

A manual print can be initiated by pressing the P or PRINT Key while the event is displayed on the Main Screen. Printing will begin immediately and proceed at a rate determined by the paper speed and amplitude range selected on Setup Screen #2.

Note: Changing the print range or paper speed only results in a change in the appearance of the printed record. The stored data are not affected and may be printed again at other settings.

A manual print can be terminated at any point after printing of the graphic waveform begins. This can be accomplished by pressing the Q or QUIT Key. The paper can be advanced to see the end of a record by pressing the O or PAPER FEED Key.

On/Off Log (PRINT LOG)

Pressing the F or PRINT LOG Key will produce a record of the last 64 times the instrument started and ceased monitoring. This will include changes in status caused by the timer function as well as turning the power on and off.

OSM/USBM Graph (PRINT GRAPH)

Pressing the G or PRINT GRAPH Key will produce an OSM graph of the event displayed on the Main Screen. This assumes, of course, that the full waveform for the event is in memory. The graph will combine the three seismic components on one chart unless the OSM Field on Setup Screen #3 is set to SEPARATE.

Disk Operation (DISK MENU)

Pressing the R or DISK MENU Key will cause the unit to display the Disk Operation Screen for the optional disk drive.

Disk Drive

The Alpha-Seismite Floppy Disk Drive is optional. It may be installed on any full waveform recording unit at the time of purchase or at a later date. The drive may also be left separate from an instrument and used only to download events on a periodic basis. A single drive can be used to download data from any number of instruments. In the automatic disk storage mode, the user only has to install a good quality high density 1.44M disk in the drive and format it.

Various procedures should be followed to help insure that disk data do not become overwritten. The instrument stores events to disk as rapidly as possible to minimize the time between events. Also, a disk can be used on more than one instrument. To conserve battery voltage, the disk power is removed when not in use. These advantages REQUIRE an operator to turn power OFF and ON or press the RESET Key whenever a new disk is installed. The following rules apply when data are being stored to disk:

1. The disk MUST be formatted or reformatted in an Alpha-Seismite disk drive, not in a computer drive.
2. The Alpha-Seismite MUST be powered OFF and ON or the RESET Key pressed whenever a new disk is installed.
3. If a disk drive or a disk is not installed, the Disk Setup Screen should specify OFF as the value of the Disk Field. This will insure that the unit will not waste power and time checking for a disk each time an event is taken.

Chapter 5. Waveform Mode

4. When all space on a disk is filled, or 158 events are stored, no more events can be stored on that disk. The seismograph can continue to store records in memory, which can be downloaded to a new disk at a later date. Users should keep the memory storage capacity of the instrument being used in mind when they are considering disk storage.
5. A disk may be used for storage on more than one seismograph. Also, a disk can be removed from the drive and then reused at a later date, as long as there is free space on the disk.
6. The same disk may be used to store events in the WRITE MODE and the WRITE BACKUP MODE. MIXED MODE recording, however, will cause the Disk event number to be different from the filename event number in some cases.
7. Reading of Directories, Summaries or Waveforms from disk will not affect any events in memory. During the read process, however, the unit cannot be triggered by an event.
8. Any event file larger than 8K cannot be printed due to an 8K buffer in the Seismite RAM. The file will still be good and can be used with software on a P.C.

Disk Menu Screen

After the seismograph has been setup, the DISK MENU Key can be pressed to access the Disk Menu Screen. This screen will be similar to the following:

FORMAT	READ	WRITE	WRITE BACKUP
A	RE-FORMAT		[EXIT]

The cursor will be on EXIT at the lower right corner of the screen. If the ENTER Key is pressed at this point, the program will exit the Disk Menu and the Main Screen will appear. Any of the five functions can be selected by bracketing the function with the cursor using the SELECT Key, and then pressing the ENTER Key. The Disk Field will be automatically set to "ON" if the DISK MENU key is pressed.

Format

The FORMAT function formats a disk for use with the Alpha-Seismite instruments. A primary directory (EVENT.DAT) is placed on one side of the disk, and a backup directory (EVENT.BAK) is placed on the other side. An event may be stored once in each directory. If an event cannot be accessed from the primary directory, the backup can be used. The disk format is DOS compatible. However, the disk must be formatted in the Alpha-Seismite drive, not in a computer.

If the ENTER Key is pressed with the cursor at the FORMAT function, a screen similar to the following will be displayed:

ENTER 5 CHARACTER FILE NAME [XXXXXX]
ENTER 8 CHARACTER DISK LABEL XXXXXXXX

The file name for each event will be eight characters in length. However, the user can only specify a file name of up to five characters. The last three characters are reserved for the disk event number. Neither the file name nor the disk label has to be entered.

The ENTER Key can be pressed to display the following format message:

FORMAT DESTROYS ANY DATA ON DISK
SELECT KEY TO CONTINUE ENTER TO EXIT

At this point, pressing the ENTER Key will exit the format and return the instrument to the Main Screen. Pressing the SELECT Key will start the format process. After the format is complete, the Disk Menu Screen will be displayed to allow any of the other functions to be used.

Chapter 5. Waveform Mode

Re-Format

The RE-FORMAT function can be used on disks previously formatted on an Alpha-Seismite or a DOS compatible P.C. It is used in the same manner as FORMAT but the RE-FORMAT requires less time to perform.

Read

If Read is selected in the Disk Menu, and the ENTER Key is pressed, a screen similar to the following will appear:

```
PRIMARY DIRECTORY SUMMARY WAVEFORM  
BACKUP DIRECTORY SUMMARY WAVEFORM [EXIT]
```

The top line of the display will contain selections for reading a Directory, Summary or Waveform from the PRIMARY Directory. The bottom line of the display will have the same selections for the BACKUP Directory.

Directory

Pressing the ENTER Key while the cursor is in the Directory Field will cause a directory of the disk to be loaded into memory. A display similar to the following will subsequently appear:

```
D001 WHITE025 1834 04-01-97 13:22
```

The designation D001 represents the disk event number that was assigned by the instrument when the event was stored on disk. WHITE025 is the file name of the event. The five character code WHITE would have been entered by the operator. The number 025 is the event number of the event in the instrument's memory. The disk event number and the file name event number may or may not be identical. The disk event number will normally be used when reading a waveform from disk. This number will indicate the order in which events are stored in the directory.

The number (1834) following the file name, is the number of bytes in the record. The displayed date and time is the date and time when the event occurred. Pressing the ARROW Keys will allow an operator to scroll through the events on disk. Pressing the PRINT Key will produce a printout of the directory.

Summary

If the ENTER Key is pressed while the cursor is in the SUMMARY Field, summary data for all events in the selected directory will be loaded into memory from disk. They will subsequently be displayed on a screen similar to the following:

```
BAT 12.7 04-01-97 13:33 IPS E001 F  
00.23T 00.31V 00.62R 122A 00.68VS D001
```

This screen format is identical to the Main Screen. In this case, however, the screen shows summary data stored on disk. The top line indicates the battery voltage, date and time of the event, the units in which the data are displayed and the original event number.

The bottom line displays peak readings for the seismic and acoustic components, and the vector sum of the three seismic components. The lower right corner of the screen contains the disk event number.

The event number can be varied with the INCREMENT and DECREMENT Keys so that all summary data on disk may be displayed. The SELECT Key can be pressed to view the frequencies for the displayed event. Pressing the PRINT Key will print the summary data from the selected directory.

Chapter 5. Waveform Mode

Waveform

Pressing the ENTER Key while the cursor is in the Waveform Field will produce a display similar to the following:

READ DISK EVENT	D001
	[EXIT]

When this display appears, the cursor will be located on EXIT. Pressing the ENTER Key at this point will return the instrument to the Disk Menu.

The SELECT Key can be used to move the cursor to the Disk Event Number. The ARROW Keys will move the cursor to any of the three digits. The operator can modify the number as required, and subsequently press the ENTER Key to read in the selected event from disk. It may be advisable to print a summary before reading a number of waveforms. This should help a user to locate any events of interest. After loading an event from disk, the event is printed.

Note: Any events exceeding 8000 bytes in size may not fully print. This is due to a limited buffer size.

Reading directories, summaries, or waveforms, does not affect any events in memory. During the reading process, however, the unit cannot be triggered by an event.

Write

Pressing the ENTER Key with the cursor in the Write Field will allow a manual download of all or selected full waveform events in the Alpha-Seismite's memory to disk. The events will only be stored in the Primary (EVENT.DAT) directory so that less time is required for the download. When downloading data in this manner, the backup files are not required since there is less chance for a disk to be damaged.

After the ENTER Key is pressed, a screen similar to the following will be displayed:

WRITE 001 EVENTS STARTING AT 001
FILENAME XXXXX [EXIT]

If the ENTER Key is pressed with the cursor is on EXIT, the Disk Menu Screen will return. The Disk Menu Screen can be used to instruct the instrument to write a number of events to disk (no more than 158) from memory starting at a particular event number.

While the previous screen is visible, the SELECT Key can be used to move the cursor to the three digit field for the number of events to write. Then, the ARROW Keys can be used to move from digit to digit in the field. Simply, type the number for each digit from the keyboard. The STARTING AT number can be set in the same manner.

After providing the STARTING AT number, the SELECT Key can be pressed to type the five character file name. The ENTER Key can subsequently be pressed to begin the downloading process, at which time the following screen will appear:

STORAGE IN PROGRESS	EVENT #001
	ENTER TO ABORT

The event number at the top right will increment as each event is stored on disk. The Disk Menu Screen will return when the download is complete.

Chapter 5. Waveform Mode

Write Backup

The "Write Backup" selection functions the same as selecting Write, with the exception that each event will be stored in both the primary and backup directory. Downloading will take longer, but the redundant data storage gives added protection. The operation of this function is identical to that for the Write function.

RS232 Operation

The Alpha-Seismite is designed to interface with a computer directly or remotely through a standard modem. The interface is a 9-pin connector on the panel inside the accessories pocket. The connector is not compatible with the 9-pin connector on a computer or other equipment. Damage may be caused unless factory approved equipment is used.

Adapter cables for various purposes are available from White Industrial Seismology, Inc. If a computer is connected using a factory supplied cable, the instrument may be operated, setup, or downloaded using special software from White Industrial Seismology, Inc., P. O. Box 1256, Joplin, MO 64802.

Standard communication software may also be used, but it will require some setup and will not decompress waveform data. It will, however, allow instrument operation and setup by modem or direct connection. This mode of operation allows any kind of data to be transferred between a computer and the Alpha-Seismite. It is not recommended that inexperienced users communicate with the instrument in this manner.

Direct Operation

Setup the communication software and connect the computer and Alpha-Seismite with an approved serial cable. Press the ON button on the Alpha-Seismite and follow the instructions supplied with the software.

Modem Operation

Any standard modem may be used. However, in most applications, it will be more practical to use a modem supplied by White Industrial Seismology, Inc. Many modems are not battery powered and are therefore not suitable for remote locations. For proper operation, the modem must be programmed to auto answer. Echoing and result codes must also be disabled.

A number of battery powered modems have been tested and will work. They will not, however, detect the ring on the phone line unless power is applied to them. This means that these modems will quickly run down a battery. The modem supplied by White Industrial Seismology, Inc. is preprogrammed, contained in a separate housing, has its own ring detect, and draws its power from the Alpha-Seismite only when actually communicating. Contact White Industrial Seismology, Inc. if a non-approved modem must be used.

Chapter 6 Charging

Charging

The seismograph should be charged whenever its battery voltage is 12.0 volts or less. If an instrument's internal lead acid battery is properly maintained, it should last for several years.

The instrument's internal battery voltage can be checked from Setup Screen #1. To charge the battery, the AC accessory charger should be plugged into the connector located in the interior compartment of the case. Charging should take roughly 8 hours depending on the condition of the internal battery. During charging, the instrument's battery voltage can be expected to stabilize at approximately 13.5 volts.

If an Alpha-Seismite is used intermittently, it should be charged at least once every two months in order to maintain its internal battery. In situations involving continuous monitoring, the instrument can be expected to operate over two months on a fully charged battery. If the monitor is used with an external car battery and/or solar charger, it can be expected to operate for a longer time period. Use of a solar charger may allow for years of continuous operation without the instrument's internal battery needing to be serviced. The monitor's charger plug can be used to connect an external battery, solar cell, or other appropriate long-term power supply.

A fully charged battery should be adequate to print several rolls of paper without needing to be recharged. However, when convenient, the AC charger should be used during instances when a significant number of records are going to be printed for review or analysis purposes.

Note: Battery life and charging capacity may be severely decreased if the battery voltage is allowed to drop below 12.0 volts for an extended period of time.

Chapter 7 General Maintenance

General Maintenance

The Alpha-Seismite is designed for ease of repair in the unlikely event of a malfunction. All major components, such as the microphones and transducers, are interchangeable between units. However, the need for repairs can be greatly reduced with proper instrument maintenance.

Dust and Moisture

The types of problems that may occur with the monitor will most likely be related to dust and/or moisture. The unit is sealed, but practical operation requires that the user periodically open the unit and its printer compartment.

There is an increased risk of corroding the circuit boards or ruining the printer if the Alpha-Seismite is allowed to accumulate moisture. This in turn could result in significant repair costs. If moisture condensation or damp paper is noticed in the unit, the instrument should be immediately allowed to dry indoors in low humidity.

Cleaning Recorder Compartment

Dust should be vacuumed from the monitor's control panel before the chart door is opened to access the recorder compartment. A portable vacuum cleaner should pay for itself in increased instrument life. Opening the chart door slowly will minimize the suction effect which tends to draw dust particles into the printer.

The recorder compartment should be cleaned each time the chart paper is replaced. Also, a soft cloth moistened with alcohol should be used to wipe off the printer platen.

Use of Desiccant to Aid in Prevention of Moisture Damage

The peripheral pocket of the Alpha-Seismite is large enough to be used to store a fairly large desiccant package. The desiccant is used to aid in the control of moisture. A fresh desiccant bag is included with each Alpha-Seismite. To help insure its drying capacity, the desiccant should be removed from the monitor on a regular basis and heated in an oven, at 350 degrees F or 175 degrees C, for two to three hours.

We strongly recommend that additional desiccant bags be kept sealed in plastic bags, and each time a unit is serviced, a fresh desiccant bag should be installed. The monitor should be stored in a low humidity area while not in use. Extra desiccant bags can be ordered from White Industrial Seismology, Inc., P. O. Box 1256, Joplin, MO 64802 for a nominal cost.

Care and Maintenance of Transducer and Microphone

Although the transducer and microphone are rugged and moisture resistant, they can be damaged by prolonged exposure to water. The microphone should not be exposed to rain without a wind screen and loosely fitting plastic bag covering it. The microphone should be immediately dried in low humidity if water enters through the hole in the top of the casing. The transducer should not be submerged in water or mud for extended periods. The transducer should also be kept above the water table if it is buried.

Electronics Maintenance

The internal components of the Alpha-Seismite should be serviced by qualified individuals. All components such as the printer, circuit boards, batteries and display are replaceable. The batteries should be replaced with the original brand and type unless the factory recommends an adequate substitution.

Chapter 7. General Maintenance

Warning: Although the batteries are replaceable, care must be taken to avoid shorting the battery terminals. Damage to the battery and injury to an individual may result if the battery is shorted.

Backup Battery

If the internal battery should fail or be disconnected, a 3.0 volt lithium battery is located on the CPU board to provide power for maintaining the setup and event data. This battery should be able to perform for several months with the primary battery disconnected. Under normal circumstances, the lithium battery will last for several years. It is advisable to replace the backup battery if the primary battery fails. If the backup battery fails, the monitor will still operate normally but will not retain any data in memory if the primary battery is removed.

The backup battery is a Matsushita Electric BR-2325. It can be replaced without removing any printed circuit boards. To replace the battery, the instrument's front panel must be removed by taking out the eight screws and pulling up on the back edge.

The front panel can be placed on its face by laying it on a pad. The primary battery must remain connected to retain memory during the replacement of the backup battery. The backup battery is about the size of a quarter and is located at the connector end of the circuit board mounting. A small screwdriver can be used to pry up the retaining tab and slide out the battery. Do not pry the tab up any more than is necessary to obtain the battery. The new battery can subsequently be slid into place and the retaining tab released.

Fuses

There are two replaceable fuses inside the Alpha-Seismite. The 5 volt power supply fuse is located on the corner of the linear circuit board near the wiring harness connector. This fuse is a 0.75 amp European or Midget type. If this fuse should fail or if it is removed, the monitor will not operate. However, the memory will draw power from the lithium backup battery until this fuse is replaced. The main fuse is located in series with the battery leads and should be replaced with a 5 amp fuse similar to the original.

Circuit Board Replacement

Individual circuit boards are available on an exchange basis to reduce instrument downtime during a repair. Circuit board replacement by the user is possible, though not desirable, unless the user is experienced in electronic repairs. All boards are directly interchangeable with replacement boards with the exception of the CPU board which contains the serial number of the instrument. A factory exchange board would have a different serial number unless the desired number is specified at the time of the order.

Board replacement can be accomplished as follows: Remove the eight screws in the monitor's front panel and lift up the panel from the back end. The battery connectors and the case wiring connectors should be disconnected. Place the panel face down on a soft cloth and remove the two screws in the circuit board mounting pan. Unplug all connections to the boards and raise the circuit boards and pan to about a 30 degree angle. Disconnect the keyboard connector beneath the CPU board and unplug all other board connectors. Slide out one or all boards without tangling them on the keyboard connector or other wiring. Remember to reconnect the keyboard and display wires when reinstalling the boards.

Warning: Circuit boards may be damaged by static electricity and should be handled with care. In some cases, static discharge from hand contact after walking on a carpet may be enough to damage sensitive components. (WARRANTY AND EXCHANGE BOARD PRICES DO NOT INCLUDE THIS TYPE OF DAMAGE.) Boards should be handled by their edges or with conductive foam if possible. Boards should be shipped in approved conductive plastic or foam. STANDARD PLASTIC BAGS OR FOAM CAN RETAIN STATIC CHARGES WHICH COULD RUIN THE INTEGRATED CIRCUITS.

Chapter 7. General Maintenance

Printer Care

Dust should be cleaned from the printer housing as often as necessary. Also, all surfaces which accumulate oil or dirt should be wiped clean. The printer platen can be cleaned with a soft cloth moistened in alcohol. The Plexiglas door should only be cleaned with a soft cloth, soap, and water.

The take-up gears and components may occasionally require a minor amount of lubricant on all bearing surfaces. This can be a lightweight machine or gun oil, but should be used sparingly. Do not allow oil to contaminate the paper or printer platen.

Chapter 8 Instrument Calibration

Instrument Calibration

The instrument's calibration should be checked and certified at least once a year. Calibration of the Alpha-Seismite can only be conducted by a factory qualified individual. More information about instrument calibration can be obtained by contacting White Industrial Seismology, Inc., P. O. Box 1256, Joplin, MO 64802.

Chapter 9 Troubleshooting

Troubleshooting

It is beyond the scope of this manual to provide a complete guide to minor repairs and troubleshooting. The following will attempt to address some typical problems that could be encountered.

Paper Jam

The paper could jam inside the holder if the paper roll has been deformed from compression on one side. The paper might also jam if the last few inches or centimeters from a deformed roll get hung in the holder or under the printer platen. If a paper jam occurs in the holder, cut or tear out the paper and replace it. If it occurs in the platen, raise the print head and pull the paper out preferably from the bottom or, if necessary, from the top.

Poor Print Quality

For best quality print, the paper should be of the type recommended by White Industrial Seismology, Inc. Other paper brands may result in poor or unacceptable print quality. Print quality can be affected by dirt on the paper or printer head. This will typically manifest itself as half printed characters, or as blank spots where print should be. If this occurs, remove the paper and clean the printer housing, platen and printer head using a cotton swab and alcohol. Allow these items to dry before reinstalling the paper.

Cold temperatures can have an adverse effect on print quality. If the temperature is significantly below 32 degrees F or 0 degrees C, the print quality may suffer. In this case the instrument will need to be removed to a warmer location for printing.

Unit Will Not Stabilize in Waveform Mode

When power is first activated, the instrument will not stabilize until the inputs from the transducer and microphone are below the unit's trigger level settings. If stabilization does not occur, it means that the background noise is greater than the trigger level settings. As an example, consider a seismic trigger level of 0.02 IPS or 0.5 MMPS. For stabilization to occur, each of the three seismic channels would have to remain below 0.02 IPS or 0.5 MMPS for approximately 10 seconds. Since 0.01 IPS is the smallest resolution of the unit, it is likely that one of the channels might not be able to stabilize with a 0.02 IPS or 0.5 MMPS trigger level.

If the Alpha-Seismite will not stabilize, turn the power off and press the Q or QUIT key while simultaneously turning the power on. This will set the seismic and acoustic triggers to MAX and OFF respectively and will also take the unit out of its automatic print mode. After stabilization is complete, the trigger level settings can be set to the desired levels. In a quiet environment, a seismic trigger level of 0.02 IPS or 0.5 MMPS may be acceptable after stabilization.

If the monitor continuously triggers after stabilization, the trigger levels will have to be reset to higher values. In this case it may be necessary to turn the power off and depress the Q or QUIT key while turning the power back on to reset the trigger levels.

Prints Continuously in Waveform Mode

The "Prints Continuously" occurrence can be stopped by pressing the Q or QUIT key during the printing of a waveform. If the instrument continues to accept events, then the trigger levels will have to be reset as previously described.

Chapter 9. Troubleshooting

Scrambled Data or Erratic Operation

If all power fails, including the backup battery, the memory will be corrupted and strange characters may be printed or displayed. The seismograph may reset and stabilize several times. This can happen when circuit boards are replaced or when strong electrical surges occur within the instrument. If this occurs, hold down the CLEAR Key while pressing the RESET Key or while turning on the power. This will clear the memory and reset the setup parameters to their default values.

Waveform Graphic Cannot be Printed

If the memory of the monitor is exceeded, only summarized data will be available for records whose waveforms are no longer in memory. If an attempt is made to print a record whose waveform is no longer in memory, the summary data will be printed and the area where the waveform would typically occur will not be printed.

Printed Waveform is Scrambled

The Alpha-Seismite full waveform instruments have a 12 second memory buffer for analyzing and storing events. If a series of events occurs in succession with a duration in excess of 12 seconds, the event currently being processed or printed will be partially overwritten by the latest event. To help prevent this occurrence, set the record time as short as is practical. Also, try to allow a few seconds between events so that processing of a current event can be completed before another event occurs. A lower sample rate can also be used to record a greater number of events.

Chapter 10 Chart Interpretation

Bargraph Chart

Header

The header occupies three lines and is printed first. The header contains the job number, seismograph serial number, starting date and time, the starting battery voltage and the calibration status. The status value should show "OK." This indicates that the calibration was good at the start of the job. The calibration is automatically tested at the start of each job. The calibration may not test "OK" if significant background vibration levels are present when the calibration test is performed. Whenever possible, begin bargraph operation while background vibration levels are at a minimum.

Comments

User comments are optional. Five lines of comments may be entered.

Scale Header

The scale header shows the units in which the data will be represented. The units for the acoustic channel will always be decibels (dB). The units for the seismic channels can either be IPS (inches per second) or MMPS (millimeters per second). Also, the printed seismic data can either be presented as PEAK or RESULT. When presented as PEAK, the data represent the highest peak velocity of the three seismic components. When presented as RESULT, the data represent the peak vector sum of the three seismic components.

Scale

The chart has two scales, one for the seismic data and one for the acoustic data. The seismic data scale has 12 divisions. The value for each division depends on the seismic recording range used. The acoustic data scale has four divisions in eight decibel increments. Peak scale values are printed on the chart to allow the operator to compare the length of the bar values in relation to the scale.

Bargraph

The printed data are represented by bars on the chart. The bars are printed in groups of six, with a small space between each group. The first group may contain less than six bars to allow the groups to be synchronized with the instrument's clock.

When printed while monitoring, the individual bars may appear together, or with a slight space, depending on the instrument's setup. When printed from memory, each six interval group will be printed as a single bar.

Summary Report

Summarized data reports may be printed at selected intervals on the chart. These summary reports contain the time of the printout and the highest peak measurements recorded since the last summary was printed. A scale will be printed following the summary report.

Ending Summary

Unless the seismograph is turned off without entering the INACTIVE MODE, an ending summary report will be printed at the end of each job. This report will print the ending date and time, a summary of the highest peaks for the job, and a calibration status report.

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Waveform Chart

Comments

As many as 240 characters are available for user comments. When a recording is obtained, if the value of the Comments Field is set to ON, the current comments will be stored with the recording in memory.

Serial Number

Each Alpha-Seismite has a unique number in memory on the CPU board which represents the instrument's serial number. This number does not change unless a replacement board with a new number is installed. The number can be used to identify the unit that was used to record a particular event.

Event Number

The event number represents the order in which events are recorded. It is stored in memory as a permanent part of the summarized data. The number by itself has no significance unless it is included with a date, time and serial number.

Event Time and Date

The time and date of the recorded event are a permanent part of the summarized data stored in memory. The time reads from 00:00 to 23:59 on a 24 hour day.

Triggers

These values represent the seismic trigger in IPS or MMPS and the acoustic trigger in decibels. There could be a discrepancy of one decibel between the decibel trigger level listed on the chart and the trigger level chosen from the display. This is due to the 0.02 millibar resolution of the instrument. This difference, however, is insignificant.

Battery Voltage

When the monitor's Main Screen is visible, a battery voltage will be displayed. This voltage will also appear on the chart record. It indicates the battery voltage of the Alpha-Seismite at the time of the recording. If the battery voltage reads 12.0 volts or less, the instrument should be charged.

Data Scale

The data scale is the amplitude scaling factor for the chart. There are 32 divisions across the chart with eight divisions occurring in each of the four channels. The IPS/DIV or MMPS/DIV is used for the transverse (T), vertical (V), and radial (R) seismic channels. The MB/DIV is used for the acoustic (A) channel. Each channel occupies four divisions above and below its center line. Therefore, the maximum value which can be shown on the chart is four times the data scale value.

In the automatic printing mode, the best data scale value for printing is selected by the instrument. Otherwise, the data scale value will be fixed at the level selected by the operator during setup.

Time Scale

Dots are placed at equally spaced intervals along the long axis of the chart at the edges of each of the channels. The time between adjacent dots is equal to the time scale value. This value will always be 0.25 second for a record with a sample rate of 1024 samples per second. The physical spacing between the dots will vary with the print speed. The frequency content of the waveform can be determined with the time scale value.

Waveform Graphics

The versatility of the Alpha-Seismite makes its graphics capability very powerful. The four channels are marked by T (Transverse), V (Vertical), R (Radial), and A (Acoustic). The divisions representing the data scale follow these markers.

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The graphics record can be from 1.0 inch or 2.54 cm to approximately 12 feet or 3.66 meters depending on the record time and print speed. The time between the first three timing marks represents the 0.5 second pre-trigger data. The third timing mark is the trigger time.

Each channel has a dot on its zero line that represents the location of the peak sample for that channel. This allows the operator to know where the peak value occurred. There will also be dots between the three seismic channels which indicate the location of the peak sample with respect to the vector sum or resultant amplitude.

The graphics printouts can be confusing if one event is represented by two separate recordings. This could happen if the duration of the vibrations is longer than the operator specified record time. In this case, the first record may be represented by a different data scale than the second record.

If the operator wished to combine the two records into a single record, the second record would have to be manually printed with the same data scale as the first record. Also, in this instance, the 50 millisecond calibration pulse of the first event would be recorded in the 0.5 second pre-trigger memory of the second event. Depending on the data scale and print speed, this occurrence should appear roughly as a spike on each of the four channels in the pre-trigger portion of the second record. However, this superimposed calibration pulse from the first record is not analyzed as part of the second record. Therefore, the peak measurements will accurately represent the peak vibration levels for that record.

Peak Data

The peak measurement for each channel is listed following the full waveform graphics. The unit of measurement for the seismic channels is IPS or MMPS. The peak measurement for the acoustic channel is shown in both millibars (Mb) and decibels (dB). The millibar level is the most accurate since the decibel level is a logarithmic function of the millibar value and is rounded to the nearest decibel. The peak vector sum of the three seismic components is also shown.

Frequency

The frequency calculation represents the lowest frequency associated with the peak amplitude for each channel. If multiple events occur before a record is printed, they will be stored in memory and their frequencies calculated as long as enough memory is available. The frequency calculation requires that the peak amplitude represent at least three bits of data. Otherwise, a frequency of zero will be provided.

Calibration Test

An automatic calibration test is performed after each event. The test is analyzed by the Alpha-Seismite to determine if the calibration is within acceptable limits. The test is always printed with the same scale and speed. After each calibration test, an indication is given for the status of the calibration as OK, LO, or HI.

WARRANTY

LARCOR warrants that each new instrument manufactured and sold by us is free from defects in materials and workmanship, and agrees to repair or replace any part of such instrument which under normal installation and use discloses such defect, provided the instrument is delivered intact to LARCOR for examination with all transportation charges prepaid within one year from the date of delivery to the purchaser, and that such examination discloses in the judgment of LARCOR that it is defective. This warranty does not extend to any parts which have been damaged by misuse, neglect, accident or improper application, nor does it cover batteries or expendable items which may be supplied with the equipment.

This warranty is in lieu of all other warranties expressed or implied, and LARCOR assumes no liability related to the use of its products other than that specified herein.