

# ABEM

## Vibraloc

Vibration Monitor

## User's Manual

Version 1.2.9 and later

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## ABEM Instrument AB

Allén 1

S-172 66 Sundbyberg

Sweden

Phone: +46 8 564 88 300

Fax: +46 8 28 11 09

Homepage: [www.abem.se](http://www.abem.se)

E-mail: [sales@abem.se](mailto:sales@abem.se)  
[support@abem.se](mailto:support@abem.se)

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## 1 Introduction

Vibraloc is a full waveform Blast Vibration Monitor with an integrated tri-axial geophone system. Air blast recordings can be made on a fourth channel using an optional microphone connected to an external connector.

The individual time history series of the seismic (V, L & T) channels and the external air blast (A) channel are stored in the built-in memory.

The memory can store up to 1000 events. The oldest events will automatically be replaced by newer events.

Vibraloc is designed for ease of use and hassle-free vibration monitoring. To ensure that it withstands the extreme demands of the harsh environments it may be exposed to, the casing is made of high grade machined aluminium. Vibraloc is completely sealed under operation. A Goretex<sup>TM</sup> membrane in the pressure-equalizing ventilator ensures that humidity on the outside of Vibraloc stays outside.

Besides being packaged for a tough life, the small footprint of the Vibraloc means that it will not obstruct ongoing activities while placed on the site of measurement.

### 1.1 This manual

This User's Manual covers operation and maintenance. A careful study of this manual is recommended before you start working with the equipment.

All ABEM instruments are carefully checked at each stage of production and are thoroughly tested before leaving our factory. They should provide many years of satisfactory service if handled and maintained according to the instructions given in this manual.

ABEM will be pleased to receive occasional reports from you, concerning your use of and experience with the equipment. We also welcome your comments on the contents and usefulness of this manual. In all communication with ABEM, be sure to include the instrument type(s) and serial number(s).

### 1.2 Unpacking and checking

When unpacking the instrument, check the contents of the box or crate against the invoice. Inspect the instrument and accessories for loose connections and inspect the instrument case for any damage that may have occurred because of rough handling during shipment.

File any claim for shipping damage with the freight carrier immediately and before the equipment is put into use. Forward a full report to ABEM, making certain to include the ABEM delivery number, instrument type(s) and serial number(s).

All packing materials should be retained for future re-shipment, e.g. for calibration or service/repair.

## 1.3 Warranty

ABEM warrants each instrument to be free from defects in material and workmanship. ABEM's liability under this warranty is limited in accordance with the terms of General Conditions for the Supply of Mechanical, Electrical and Associated Electronic Products (ORGALIME S2000, Brussels, August 2000). It covers the servicing and adjusting of any defective parts (except tubes, transistors, fuses and batteries). The warranty is effective for twelve (12) months after the delivery date, provided that the instrument is returned carriage paid to ABEM. If misuse or abnormal conditions have caused the fault, repairs will be invoiced at cost.

Should a fault occur that could not be remedied on site, please send full details to ABEM. It is essential that instrument type and serial number is included and, if possible, the original ABEM delivery number. On receipt of this information, disposition instructions will be sent by return. Freight to ABEM must be prepaid. For damage or repairs outside the terms of the warranty, ABEM will submit an estimate before commencing the repair work.

Be sure to fill in the warranty registration card (included with the equipment) correctly and return it to ABEM promptly. This will help us process any claims that may be made under the warranty. It will also help us to inform you of free software upgrades etc. ABEM welcomes your response at any time.

**Do not return instruments to ABEM until shipping instructions have been received from ABEM.** Please contact ABEM on fax number +46 8 28 11 09 or e-mail [sales@abem.se](mailto:sales@abem.se).

## 1.4 Support and further help

If in doubt you are welcome to contact [support@abem.se](mailto:support@abem.se) for further advice.

## 1.5 Compliance

Vibraloc and its accessories conform to the essential requirements in the Low Voltage Directive 73/23/EEG, 93/68/EEG and the Electromagnetic Compatibility Directive 89/336/EEG of the EC.

## 2 Create your first vibration record

The objective of this chapter is to give you a first introduction to vibration measurement with Vibraloc.

Vibraloc is delivered ready to use, with factory default settings (see 15.2) and batteries installed, enabling you to make a trial vibration measurement directly.

Place your Vibraloc on a table. If a microphone is included in your delivery, leave that out for this experiment.

### 2.1 Starting the Vibraloc

Press **F** to start your Vibraloc.

After a few seconds you will see the following...

```
Initiating...
```

```
( 1 _ 2 _ 6 )
```

“REG” diode off

A little bit later this appears (see 3.2 for details):

```
VIBRALOC
S/N:    223
10 May 2009 10:45:24
Press F
```

“REG” diode off

Go to the Main Menu

Press **F** again to go to the Main Menu. The following page appears:

```
Main Menu
Event List
Histogram
Setup
```

“REG” diode off

### 2.2 If the LCD is turned off

The LCD display is automatically turned off three minutes after the latest key press. You can turn on the LCD by pressing **F**.

## 2.3 Start monitoring

Press **S** + **F** to turn monitoring ON. This message appears on the display:

```
Start requested...
```

“REG” diode off

A few seconds later the display informs that offset adjustments are taking place:

```
Offset adjust...  
Please wait
```

“REG” diode off

After a while the red diode will start blinking, and a status message will appear on the display:

```
Monitoring ON...  
Status: Vt L T# A_  
Batt: 2.51 V Ok  
Press F
```

“REG” diode blinking

Your Vibraloc is now scanning for incoming vibrations, ready to start recording as soon as the trigger level of any of the V, L & T channels is exceeded. (For more information about trigger levels, see 6.2.)

Press **F** and the main menu will appear:

```
Main Menu  
Event List  
Histogram  
Setup
```



“REG” diode blinking

## 2.4 Create and record a vibration

By pounding or rocking the table your Vibraloc is placed on, you will create a vibration exceeding the trigger levels. The red diode becomes steady, indicating that the instrument has started recording. When the diode goes back to blinking, the vibration signal is stored in the memory, and the newly recorded data is displayed on the LCD.



You should see something like this:

First...

```
Recording...  
#234 12 seconds  
Trigger: V
```

“REG” diode steady

Then...

```
Calculating...  
#234 60% done
```

“REG” diode steady

And then...

```
#234 Wed 10May 14:25  
V=18.5 mm/s  
L=10.1 mm/s  
T=17.0 mm/s F=Info
```

“REG” diode blinking

On the first line you will see the Event Number and the date and time of your recording.

Lines two to four provide the peak particle velocity readings of all three geophone channels (Vertical, Longitudinal and Transversal) including the measuring unit.

If you like, you can now create a few more records for further studies.

For further information about an individual event, press **F** and refer to 4.3.

## 2.5 Stop monitoring

To end this recording session, press **S** + **F** to turn monitoring OFF.

## 3 Getting acquainted with your Vibraloc

This chapter will introduce you to the basic functions of Vibraloc.

### 3.1 The Vibraloc instrument

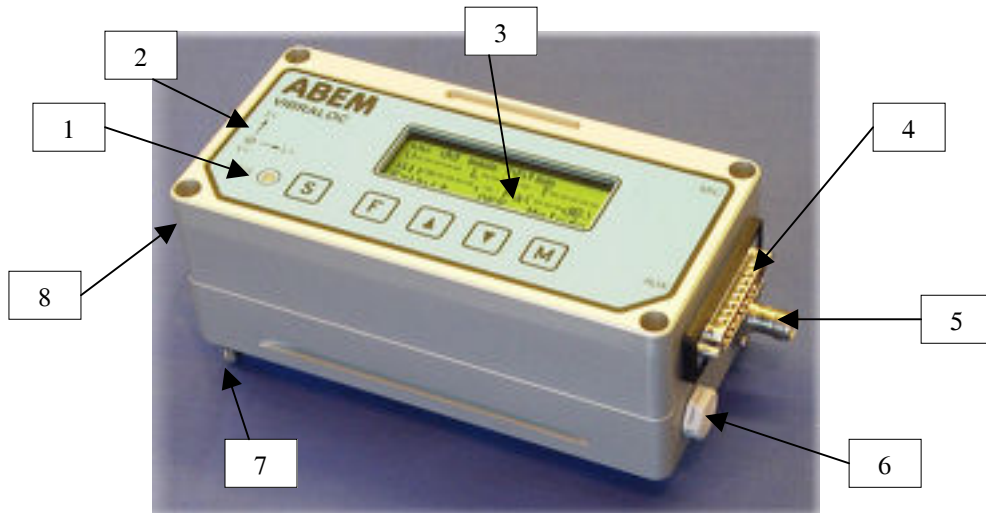


Figure 1. Vibraloc

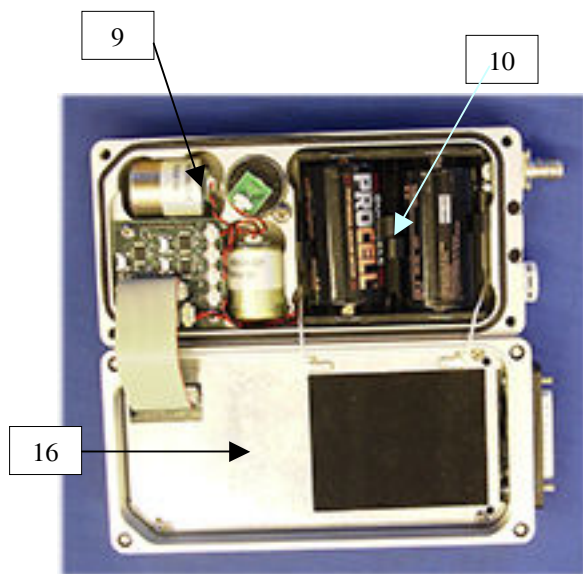


Figure 2. The instrument, opened

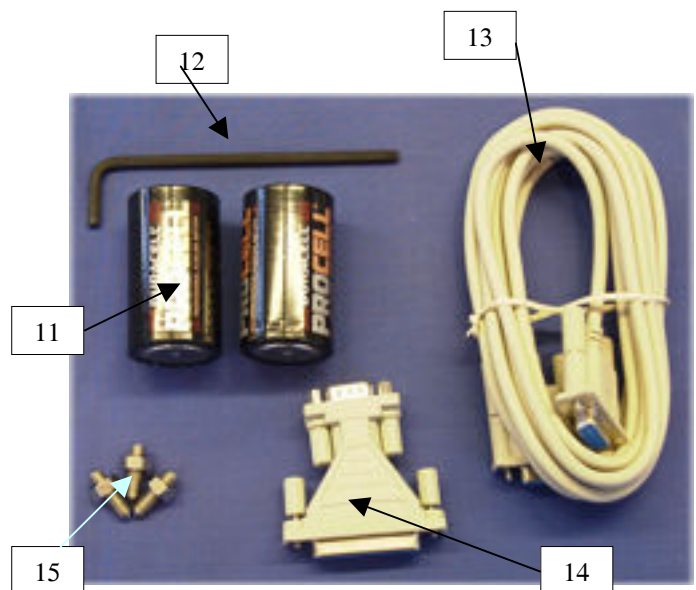


Figure 3. Standard accessories

- |   |                             |
|---|-----------------------------|
| 1. LED, used for recording indication ("REG")                               | 8. Serial Number            |
| 2. Definition of the positive direction of each geophone                    | 9. Geophones                |
| 3. LCD  | 10. Battery compartment     |
| 4. AUX (D-sub) connector including RS232, external power & external trigger | 11. LR20 dry cells          |
| 5. External microphone connector (MIC)                                      | 12. Hex head key            |
| 6. Ventilator   | 13. AUX cable               |
| 7. Leveling screws  | 14. 9-pin/25-pin adapter    |
|   | 15. Leveling screws         |
|   | 16. Electronics compartment |

## 3.2 The Start Up Pages

The Start Up pages will appear (after a few seconds) when you press **F** when the Vibraloc is turned off.

First you will see...

```
Initiating...
```

```
(1_2_6)
```

“REG” diode off

Then...

```
VIBRALOC
```

```
S/N: 223
```

```
10 May 2009 10:45:24
```

```
Press F
```

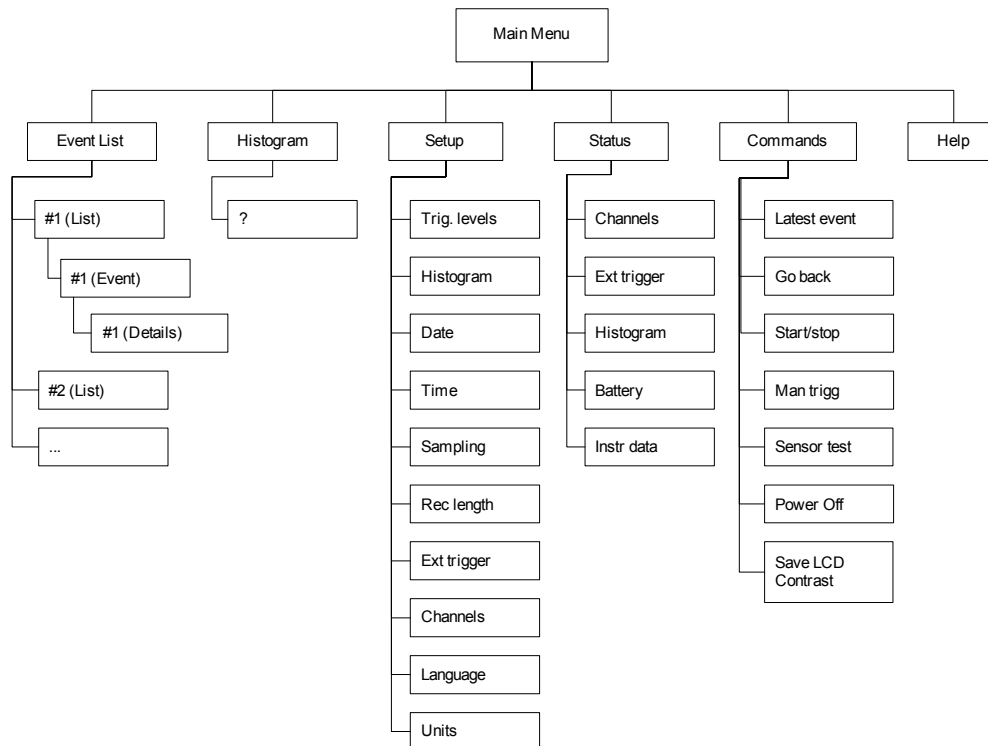
“REG” diode off

The Serial Number (S/N) of this instrument appears on the second line, and the current date and time of the internal clock on line three. (For setting of the internal clock, see 6.3 and 6.5.)

Press **F** again and the screen will change into the Main Menu.

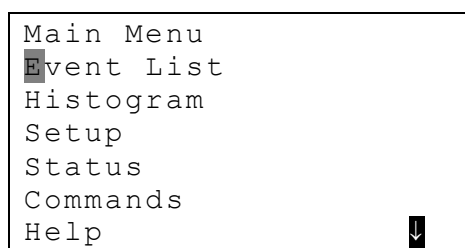
## 3.3 The Menu System







The structure of the Vibraloc menu system is as follows:





**Figure 4. The Vibraloc menu system**

You will reach the Main Menu from any position in the menu system by pressing **M** one or several times (from the Start Up Page by pressing **F**).




Some menus (the Main Menu being one of them) contain more items than you can see at one time on the display. A blinking arrow  in the top right corner indicates that there is more information “above” the current view. Consequently a blinking arrow  in the bottom right corner indicates that there is more information “below” the current view. To scroll through the complete menu use the  and  keys, as indicated by these arrows. In some cases you will see blinking arrows   in both right corners as there is more information



both “above” and “below” the current view. Holding the  or  key down will speed up the scrolling.

Here is an example of how a scrolling within the Main Menu would look:


```
Main Menu
█ Event List
Histogram
Setup
```






```
Event List
Histogram
Setup
█ Status
```



```
Setup
Status
Commands [S+M]
█ Help
```



To select one of the items and open it, use the  and/or  keys and then press .







### 3.4 The LCD

The LCD of Vibraloc is normally turned off. To turn on the LCD, press .

If you don't press any key for three minutes, the LCD will be turned off.

### 3.5 The Keyboard

Vibraloc is operated with the 5 keys on the front panel.

| Key or key combination  | Function  |
|---|---|
|                      | Shift   |
|                      | Function/Enter/Wakeup   |
|  hold down 3 seconds | Power OFF (if monitoring is OFF)<br>LCD OFF (if monitoring is ON) |
|                      | Menu  |
|                      | Move up/Increase value  |
|                      | Move down/Decrease value  |

| Key or key combination | Function          |
|------------------------|-------------------|
| <b>S</b> + <b>M</b>    | Commands menu     |
| <b>S</b> + <b>F</b>    | Monitoring ON/OFF |
| <b>F</b> + <b>M</b>    | Hard reset        |

### 3.6 Move Around and Change Settings

The **S** (Shift) key is used in combination with the other keys

The **F** (Function) key is used to activate a selected item. This means that you can bring up a submenu or move forward in a setting procedure.

The **↑** and **↓** keys are used to move the selection and change a setting.

The **M** (Menu) key is used to return to the previous menu. You will always reach the Main menu by pressing the **M** key one or several times.

### 3.7 Operation modes

Vibraloc has two operation modes: Monitoring OFF and Monitoring ON.

To toggle between these two modes, press **S**+**F**.

The current state is indicated by the “REG” diode on the front panel:

| “REG” diode status: | Indicates:                                   |
|---------------------|--|
| Off                 | Monitoring OFF.                              |
| Red, slow blink     | Monitoring ON, waiting for a trigger signal. |
| Red, steady light   | Monitoring ON, recording (has triggered).    |
| Red, double blink   | Monitoring ON, low battery.                  |

Changes in operation mode are also shown by screen messages (see 3.8).

### 3.8 Screen messages

The display will now and then present messages about what is going on. The messages will appear automatically and disappear when you press **F**. All messages have a heading ending with three dots “...”. For example, the following message would appear if the T channel had been damaged:

```
Monitoring ON...
Status: Vt L T# A_
Batt: 2.51 V Ok
Press F.
```

## 3.9 Channels and sensors

Vibraloc has four channels; three are used for the integrated geophones (V, L & T) and one for the (optional) external microphone (A). The channels are continuously checked with reference to input impedance. This is used for the channel test, which indicates whether a sensor is connected or not.

## 3.10 Channel Status Indications

| Displayed value: | Meaning:                                  |
|------------------|---|
| Vt               | Channel V is Ok. Trigger function is ON.  |
| V                | Channel V is Ok. Trigger function is OFF. |
| V#               | Error in channel V.                       |
| V_               | Channel V is OFF (not used).              |

## 3.11 Data Values

| Displayed value: | Meaning:                     |
|------------------|------------------------------|
| V= OFF           | Channel V is OFF (not used). |
| V= 23.4 mm/s     | Recorded value.              |
| V= >250 mm/s     | Value is out of range.       |
| V= ERROR         | Data is missing or faulty.   |

## 3.12 Accessories

There are a number of accessories available for Vibraloc. The most important ones are presented below.

### 3.12.1 Air blast microphone

The optional air blast microphone is used for measuring of the air shock wave, associated with blasts and sometimes powerful enough to damage windowpanes etc. For further information refer to chapter 12.



**Figure 5. Air blast microphone**

### **3.12.2 Wall mounting device**

A special wall & floor-mounting device is available as an option.



**Figure 6. Wall mounting device**



## 4 Events

Vibraloc, equipped with the nominal 8 Mbytes event memory, is capable of storing about 1000 events (1000 Hz sampling rate and 1 second recording length). All events are stored in time order. Each recorded event is sequentially numbered from 1 and upwards (although you will only see the last three digits of the event number).

You can always reach the latest event from any position in the menu system by pressing the **S**+**M** keys and selecting the “Latest event” command.

The Event list menu works a bit different from the rest of the menus. There are three different views that you can work with:

- The Event List view provides a list of all events.
- The Event Summary view provides the basic information of a selected event.
- The Event Details view provides all the details about the selected event.

### 4.1 The Event List

The Event List view contains a complete list of all events.

```
Event list:
#001 START
#002 SENSOR TEST
#003 Tue 06May 10:25
#004 Wed 07May 16:00
#005 STOP
...
#159 Fri 24Oct 11:03
```

The list contains more items than you can see at one time on the display. Therefore, when you open the list you will see only the three latest events.

```
Event list:
#157 Wed 22Oct 14:30
#158 Thu 23Oct 10:25
#159 Fri 24Oct 11:03
```

As always, use the **↑** and/or **↓** keys to scroll through the list.

```
Event list:
#111 Mon 18Aug 10:03
#112 Wed 20Aug 14:25
#113 Fri 22Aug 12:00
```

To display the selected event as an Event Summary, press **F**.

## 4.2 The Event Summary

The Event Summary of a triggered vibration recording provides the following information:

|                      |
|----------------------|
| #112 Wed 20Aug 14:25 |
| V= 18.5mm/s          |
| L= 10.1mm/s          |
| T= 17.0mm/s F=Info   |

- On the first line you will see the Event Number (#112) and the date and time of this recording.
- Lines two to four provide the peak particle velocity values of all three geophone channels (Vertical, Longitudinal and Transversal).
- If the A channel is used (a microphone is connected) the readings of this channel will be available after pressing **F** (see 4.3 below).

You can use the **↑** and **↓** keys to display the previous or next event.

For detailed information about the currently displayed event, press **F**.

In Monitoring ON mode, the Event Summary will appear automatically as soon as an event has been recorded.



## 4.3 The Event Details View

The Event Details view provides detailed information about a selected event. A triggered vibration recording would look like this (for other event types see 4.4 below):

```
#112 Vibration
20 Aug 14:25:03
Status: Vt Lt Tt A
Peak velocity
V: 18.5 mm/s
L: 10.1 mm/s
T: 17.0 mm/s
Zero cross freq
V: 7.5Hz
L: 1.1Hz
T: 1.1Hz
Peak acceleration
V: 5.2 m/s2
L: 3.0 m/s2
T: 2.0 m/s2
Peak displacement
V: =60 um
L: =20 um
T: =20 um
Length: 10s Auto
2.63V OK
ID: 12001
```

As with the Events list, the Event Details view contains more items than you can see at one time on the display. Therefore, when you open the list you will see only the first four lines:

```
#112 Vibration
20 Aug 14:25:03
Status: Vt Lt Tt A
Peak velocity
```

To scroll through the complete list, use the  and/or  keys.

The channel status (see 3.10) is recorded with each event and displayed as “Status:” in the Event details view.

In addition to the peak *velocity* values presented in the Event summary, the Event details view also provides the calculated peak values for *acceleration* and *displacement* as well as (if connected) the air blast peak value in Pa and dB of the A channel.

Furthermore, the battery voltage *at the time of the event* (as opposed to the *current* voltage displayed in the Status Menu, see 7) and the length of the event are presented.

Finally, on the last line you will see the complete event ID (of which you normally only see the last three digits).

## 4.4 Event Types

The most important event types are vibration recordings and histograms. However, for record keeping purposes there are a few more event types:

- Start and Stop events, which define the monitoring periods
- Sensor Test events
- Dead Time events

#### 4.4.1 Vibration Events

A vibration event recording will appear like this in the Event summary view:

```
#112 Wed 20Aug 14:25
V=18.5 mm/s
L=10.1 mm/s
T=17.0 mm/s      F=Info
```

A missing measurement value can be indicated as:

- “OFF” if the channel was OFF (not in use, see 3.11).
- “ERROR” if there was an error with the channel.

Press **F** for more details about the event (see 4.3).

#### 4.4.2 Histogram Events

A histogram event recording will appear like this in the Event summary view:

```
#008 Thu 04Jun 13:32
HISTOGRAM
F=Info
```

Press **F** for more details about the histogram. The following will appear

```
#008 HISTOGRAM
04 Jun 2009 13:32:57
Status: Vt Lt Tt A
Count 312
Period: 2:00
2.95V OK
ID:      8
```

#### 4.4.3 Start Events

A regular (user initiated) Start event will look like this:

```
#003 Tue 06MAY 10:25
START
F=Info
```

For further details about this event, press **F**.

#### 4.4.3.1 Start Details

```
#003 START
Tue 06MAY 10:25:03
Status: Vt Lt Tt A
User initiated
2.63V OK
ID: 12003
```

**Note!** The battery voltage displayed here is that at the time of the event (as opposed to the current voltage, see 7.3)

#### 4.4.4 Stop events

There are two types of Stop events:

- Regular, user initiated Stops.
- Automatic ERROR Stops due to errors detected by the instrument, for instance low battery voltage.

##### 4.4.4.1 Stop

A regular (user initiated) Stop event will look like this:

```
#005 Tue 06MAY 10:25
STOP

F=Info
```

##### 4.4.4.2 Stop Details

```
#005 STOP
06 May 2009 10:25:03
Status: Vt Lt Tt A
User initiated
2.63V OK
ID: 12005
```

##### 4.4.4.3 Error Stop

An Error Stop event due to low battery voltage (see 15.3) will look like this:

```
#006 Tue 06MAY 10:25
ERROR STOP

F=Info
```

#### 4.4.4.4 Error Stop Details

```
#006 ERROR STOP  
06 May 2009 10:25:03  
Status: Vt Lt Tt A  
Low battery  
2.63V Low  
ID: 12005
```

#### 4.4.5 Sensor Test events

A Sensor Test event can be created on demand via the Command menu (see 8.5).

A voltage is applied on each geophone channel, whereby the moving part of the geophone is offset from its resting position. The voltage is then released and the resulting geophone signal is recorded.

A properly functioning geophone creates a typical reading. Also open and short circuit channels, as well as certain types of other sensors, will provide specific signatures.

**Note!** Please note that in addition to the sensor test events there is a continuous channel status check going on in Monitoring ON mode (see 3.9).

##### 4.4.5.1 Sensor Test

A Sensor Test event will look like this:

```
#002 Tue 06MAY 10:45  
SENSOR TEST  
  
F=Info
```

#### 4.4.5.2 Sensor Test Details

```
#002 SENSOR TEST
Tue 06MAY 10:45:03
Status: V# L# T# A_
Peak Velocity
V: 234mm/s
L: 235mm/s
T: 232mm/s
Zero cross freq
V: 7.7Hz
L: 0.0Hz
T: 7.4Hz
Peak Acceleration
V: 434m/s2
L: 434m/s2
T: 416m/s2
Peak Displacement
V: 707um
L: 1869um
T: 385um
Length: 2s Auto
2.86V Ok
ID: 40
```

**Note!** In this case the “#” indications for channels V, L & T mean that the error detections function is working.

#### 4.4.6 Dead Time events

A Dead Time event is created when monitoring is on and the Vibraloc cannot store vibration data because it has temporarily run out of buffers (memory).

## 5 Histogram

When histogram recording has been activated (see 6.3), registration is on and the first histogram event has been created then the current histogram event data will be shown when Histogram is selected from the main menu.

```
#008 HISTOGRAM
04 Jun 2009 13:32:57
  28    3.6    6.3
  3.8    2.1    4.7
.
.
.
04 Jun 2009 15:23:09
  0.7    0.9    0.8
```

The first two lines show the event number and the date and time when the Histogram was created. The last two lines show the last recorded histogram data and the date and time when it was recorded. Pressing any button except **M** will update the last two lines with the current peak data. The lines in between the first and last lines show the rest of the recorded histogram data.

If the conditions mentioned above are not fulfilled then the display will instead show one of three different cases:

1. When histogram recording is activated and registration is on but the first histogram event has not been created yet

```
No Histogram data
Working...
```

2. When histogram recording is activated but registration is off

```
Registr. not started
```

3. When histogram recording is off

```
Histogram is OFF
```

Previous firmware versions (before 1.2.9) displayed this for all three cases.

```
No Histogram data
```



## 6 Setup

The Setup Menu contains the following items, which can be changed by the user in submenus.

```
Setup
Trigger levels
Histogram: OFF
Date: Thu 08May 2009
Time: 08:25:44
Sampling: 1000Hz
Rec. length: Auto
Ext. trigger: OFF
Channels
Language: English
Units: Metric
```

Lines with values can be edited as described in 6.1 below, whereas “Trigger levels” and “Channels” are edited in submenus (see 6.2 and 6.9).

### 6.1 Changing Setup Values

To change a setup value, select it in the Setup Menu (or its submenu, see above), and press **F**.

```
Set Sampling:
4000Hz
```

The selected value can now be changed by using the **↑** and **↓** keys.

Press **M** to save the new value and return to the previous menu.

### 6.2 Trigger levels

The trigger level is the preset vibration (and/or air blast) value at or above which Vibraloc will start recording. If the trigger level of *any of the channels with the trigger function activated* (see below) is exceeded, recording will be made on *all channels in use* (see 6.9).

To secure proper recording, the trigger levels must be correctly set according to the specific measurement conditions:

- A too low trigger level will provide false recordings due to the surrounding vibration noise.
- A too high trigger level could result in missed recordings.

For near-field blasting measurements, such as close to a construction site, trigger levels in the order of 3-5 mm/s (0.1-0.2 ips) are normally appropriate.

For far-field measurements, e.g. at a certain distance from an open pit mine, trigger levels below 1 mm/s (0.04 ips) might be necessary not to miss the blast. In such a case the lowest possible trigger level due to the vibration noise should be used. The current noise situation can be checked in the Status Menu (see 7.1)

The trigger function should normally *not* be activated on the Air channel. The reason is that the propagation velocity of an air blast wave is much lower than that of a seismic wave. Therefore, in most cases the instrument has already triggered and is recording when the air blast wave reaches the microphone.




For more details about air blast measurement, refer to chapter 12.



Having selected Trigger levels from the Setup menu, the following submenu appears:





```
Trigger levels
Trig V: 3.0mm/s
Trig L: 5.0mm/s
Trig T: 5.0mm/s
Trig A: Channel OFF
```

The trigger levels of the V, L & T channels can be set from 0.1 to 200 mm/s (0.01 to 8 ips).

The trigger levels of the A channel can be set from 2 to 150 Pa/100 to 137 dB (you can see both values on the display at the same time).

To set/change a trigger level, use the  and  keys to select the actual channel and press . The setting menu for the selected channel appears:


```
Set Trig V:
0.1mm/s
  +/- 1.00
```

To change the trigger level use the  and  keys and press  to confirm the new setting. Pressing  will change the increment used from 1.00 to 0.10 to 0.01 and back to 1.00 again.

Channels that shall not trigger (e.g. the A channel, see above) shall be set to Trigger OFF (indicated by “\_\_\_”). This value is placed “below” the lowest available setting.

## 6.3 Histogram

The histogram setting can be set to OFF or to record histogram data for a number of days. Currently this is possible for 1 to 21 days.

```
Histogram:
FF
```

```
Histogram:
█ 2 days
```

As before you use the **↑** and **↓** keys to change the value. Press **M** to return to the Setup menu.

## 6.4 Date

The date of the internal clock can be set in the Date submenu:

Only valid dates are accepted (e.g. not 30Feb or 31Apr). If you try to enter such a date, Vibraloc will automatically select a valid date.

```
Set Date:
Tue 06May 200█
```

The selected value is changed by using the **↑** and **↓** keys. The new value is confirmed and the selection is moved to next item by pressing **F**. Press **M** to return to the Setup menu.

## 6.5 Time

The time of the internal clock can be set in the Time submenu:

```
Set Time:
█ 10:45:00
```

The selected value is changed by using the **↑** and **↓** keys. The new value is confirmed and the selection is moved to next item by pressing **F**. Press **M** to return to the Setup menu.

## 6.6 Sampling

The sampling rate (sampling frequency) defines at which rate the signal is digitally converted, peak value calculated and stored. Vibraloc can work with five different sampling rates 100, 500, 1000, 2000 or 4000 Hz.

```
Set Sampling:
4000Hz
```

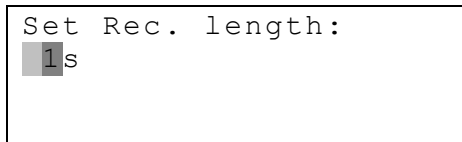
## 6.6.1 Which sampling rate should I use?

Selecting the sampling rate is a compromise among a number of parameters. The rate has an impact on:

- The accuracy of the measurement
- The memory required for each event (see 15.4)
- The time it takes to transfer the event data (e.g. to PC)
- The battery life.

Furthermore, national norms may define minimum sampling rates.

## 6.7 Recording length



The recording length is by factory default set to Auto mode (see below). Alternatively, a fixed recording length can be set to 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 60, 70, 80, 90 or 100 seconds.

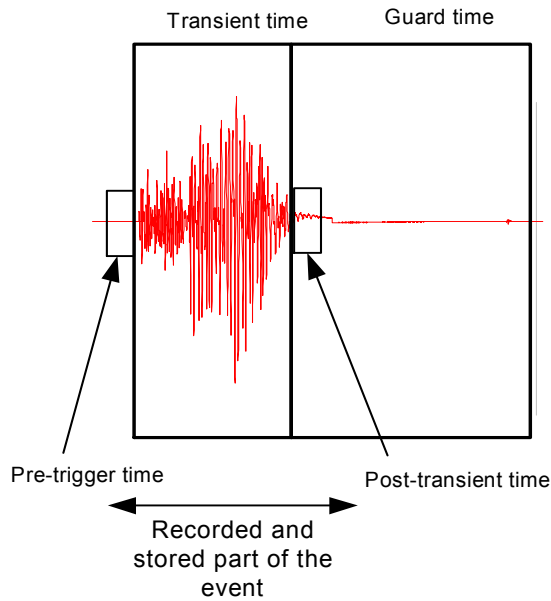
A pre-trigger, i.e. a recording sequence before the trigger moment, precedes each recording. The length of the pre-trigger is 10% of the selected recording length, although maximum 0.5 seconds (from 8 seconds recording length and upwards). In Auto mode the pre-trigger is always 0.5 seconds.

### 6.7.1 Auto recording length

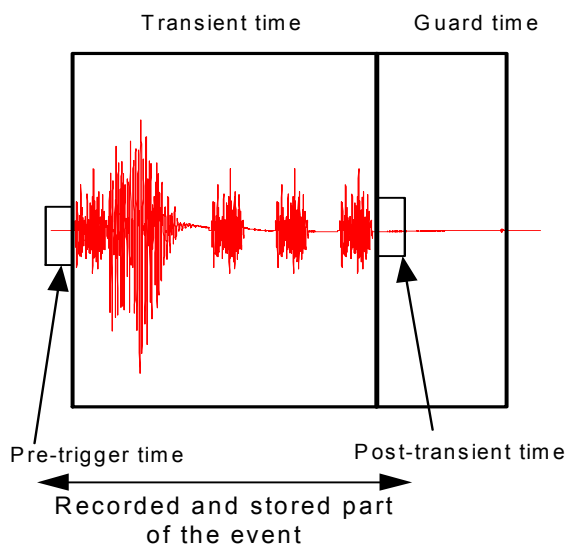
The Auto recording length alternative can be used for all normal blasting. In this mode, the recording stops automatically when the signal has gone below the trigger level and remained there for 2 seconds. The last “silent” part of the recording is automatically removed, except for a 0.5 second post-transient (see below).

The Auto setting creates recordings with different lengths and provides optimized utilization of the event memory.

An Auto event consists of the pre-trigger time, the transient time and the post-transient time. In Auto mode the pre-trigger and post-transient times are fixed at 0.5 seconds. The transient time runs from the moment when the signal exceeds the trigger level until the moment it falls below the trigger level and remains there for a 2 seconds guard time. If something happens after the guard time, it is treated as a new event and stored separately.



**Figure 7. Auto recording length - Surface blast (millisecond delays only)**



**Figure 8. Auto recording length - Underground blast (millisecond & half-second delays)**

## 6.8 External trigger

```
Set Ext. trigger:
OFF
```

The External trigger feature enables you to trigger Vibraloc using an external device connected to the AUX port. The trigger command is executed by contact closure of two pins in the connector (see 15.5 for wiring details).

## 6.9 Channels

In the Channels submenu each channel is set according to the type of sensor used. Any channel that shall not be used must be set to the OFF position.

```
Channels
V: Geophone
L: Geophone
T: Geophone
A: Mic. (1.5 mA)
```

The following submenu appears when a channel is selected and **F** is pressed:

```
Set V:
Geophone
```

Available options for the V, L & T channels are Geophone or Channel OFF.

Available options for the Air channel are Mic 1.5mA or Channel OFF.

**Note!** It is important that the Air channel is in OFF position if no microphone is connected; otherwise there is risk for electromagnetic disturbances in the recordings.

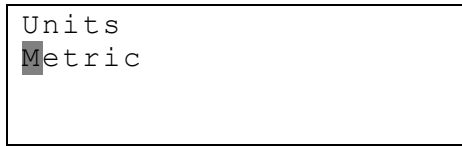
## 6.10 Language

This menu shows the language used for the display presentations.

```
Set Language:
English
```

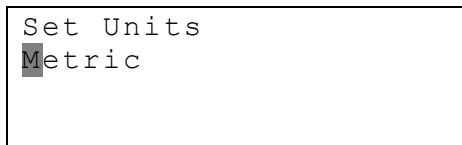
Factory installed language is English. At the moment this is the only language supported.

## 6.11 Units



This menu shows which units (Metric or Imperial) are used for the value presentations.

To change the Units setting, press **F**.



Use the **↑** and **↓** keys to change the setting.

Press **M** to return to the previous menu.

## 7 Status

The Status menu provides the following information:

```
Status
Channels
V: Ok ()
L: Ok ()
T: ERROR (#)
A: OFF (_)
Ext Trig: No trig
Histogram
V: Ok ()
L: Ok ()
T: ERROR (#)
A: OFF (_)
Battery: 2.63V Ok
Instrument data
S/N: 314
Calibrated:
Wed 06May 2009
ABEM-VI-314-0
SW: 1_2_6
```

### 7.1 Channels

Real time information from the continuous test function on each channel (see 3.9) is provided here.

### 7.2 External Trigger

This line provides real time information about the external trigger situation, i.e. whether there is a trigger signal on these pins of the AUX connector or not. (The external trigger function can be in ON or OFF position; this is handled via the Setup Menu, see 6.8.)

### 7.3 Battery

The current battery voltage is provided here.

For further information about battery status and capacity etc. refer to 15.3.

|              |   |
|--------------|---|
| <b>Note!</b> | Please note the difference between this <b>current voltage</b> and the <b>event voltage</b> (voltage at the time of the event) as displayed in the Event Details view (see 4.3) |
|--------------|---|



## **7.4 Instrument data**

### **7.4.1 Serial number**

The serial number of your Vibraloc is visible on the serial number sticker on the outside of the instrument. It is also programmed into memory of the device and is always copied into the data stored with each event. This is useful for your record keeping.

### **7.4.2 Calibrated**

The date of the latest calibration, including certificate reference, is provided here. Authorized service personnel enter this information.

Calibration requirements can vary depending on the norm applicable in your country, or specifications in the contract for the current project.

For further information, refer to chapter 13.5.

## 8 Commands

This menu contains a number of “general” commands. Some of them can also be executed from other positions in the menu system by using the respective short cut keys as provided below and in the Help menu.

```
Commands [S+M]
Latest event
Go back
Manual trigger
Sensor test
Power OFF
Save LCD contrast
```

### 8.1 Go to latest event

By pressing F when positioned on the Latest event line, the display presentation will go to the latest recorded event.

### 8.2 Go back

The Go back function takes you back to the previous menu, e.g. if you are in Setup and your Vibraloc starts recording an event.

### 8.3 Start/Stop monitoring (S + F)

You can toggle between monitoring ON and OFF by selecting the Start/Stop command and pressing the F key, or by pressing the short cut key S + F. You will see a different message depending on the current state of the instrument:

#### In monitoring OFF:

```
Start requested...

V=Ok L=Ok T=Ok A=Ok
```

When monitoring has started:

```
Monitoring ON...
Status: Vt Lt Tt A_
Batt: 2.63V Ok
Press F
```

#### In monitoring ON:

- a) Not recording:

```
STOP requested...
```

b) Recording in progress:

```
STOP requested...  
Recording in progress  
56%...
```

When finished:

```
#003 TU 06 May 10:25  
STOP  
V=OK L=OK T=!! A---  
F=Enter M=Menu
```

## 8.4 Manual Trigger

The manual trigger command is used to start recording on demand, without the trigger levels being exceeded. This command is available when in monitoring ON mode only. An error message will be displayed if the command is activated when in monitoring OFF mode.

After pressing **F**:

```
Recording...  
Manual trigger  
  
Please wait...
```

The result will be a regular event recording.  
(There is also an External trigger feature available, see 6.8).

## 8.5 Sensor test

In addition to the sensor tests included in the Start monitoring and vibration recording processes, you can initiate an on demand sensor test at any time, as long as your Vibraloc is in monitoring ON mode. An error message will be displayed if the command is activated when in monitoring OFF mode.

Select the Sensor test item in the Commands menu and press **F**:

```
Sensor Test  
#038    0 seconds  
  
F=Info
```

The test will create a sensor test event. See 4.4.5 for more information.

## 9 Help

The Help menu provides a short list of the most useful Vibraloc commands.

```
Help
Use key [↑] or [↓]
to move selection.
[M] Menu:
Show menu
[F] Function:
Activate function of
next edit position
Power off after 3 min
[Shift M]:
Commands menu
[Shift F]:
Toggle monitoring o
Channel status:
Vt = Ch.V Ok, trig o
V  = Ch.V Ok
V# = Ch.V error
V_ = Ch.V off
Press [M] for menu
```

## 10 PC Software

Included in the delivery of your Vibraloc is a CD with the following PC programs

- Vibraloc PC                      Transfer data between Vibraloc and PC
- Vibraloc Event Presentation    Presentation of vibration data on the PC

The following programs are optional

- Vibraloc Event Analysis        Analyze measurement data
- Vibraloc Peak                    Analyze peak data

The latest version of all software and manuals can be found on ABEM's home page [www.abem.se](http://www.abem.se).

### 10.1 Installing the software

To install the PC software in your PC, insert the CD and follow the instructions on the screen.

|   |
|---|
| <b>Note!</b> Previous versions of the software must be uninstalled before installing new versions |
|---|

### 10.2 Vibraloc PC

The Vibraloc PC software is used for data transfer between Vibraloc and PC.

The serial cable with the 9/25-pin adapter, included in the delivery of your Vibraloc, is used for communication between Vibraloc and your PC. Vibraloc PC can be used to communicate with your Vibraloc when the serial cable is connected and the Vibraloc is started.

For details on how to transfer data to and from your PC, see the separate Vibraloc PC User's Manual.

### 10.3 Vibraloc Event Presentation and Vibraloc Event Analysis

Vibraloc Event Presentation is used for presentation of measurement data on your PC. Vibraloc Event Analysis is an upgrade that adds time and frequency domain analysis.

For details on how to use these programs, see the separate Vibraloc Event Presentation and Vibraloc Event Analysis User's Manual.

### 10.4 Vibraloc Peak

Vibraloc Peak is used for selection and presentation of peak data.

For details on how to use this program, see the separate Vibraloc Peak User's Manual.

## 11 Your Vibraloc in field operation

Due to varying national standards, the methods of blast vibration monitoring often differ from one country to another. If no national norm is established in your country, the contract documents may refer to a specific norm, or include special requirements.

### 11.1 Before you go to the field

In order to avoid unexpected problems, it is advisable to check a few things before you take your Vibraloc to the field.

- The battery status should be checked either in the Status menu (see 7.3) or by creating a START event using the **S + F** keys.

For further information about battery status and capacity etc refer to 15.3.

For replacement of internal batteries, refer to 13.1.1.

- The various user settings should be checked/adjusted in the Setup menu (see 5).
- A sensor test should be done, especially if external sensors are used. See 8.5 for information about the on demand sensor test command.

### 11.2 Mounting

In general, there are two main principles for mounting a vibration monitor in the field:

- On/in the ground outside the measurement object (building etc).
- On the measurement object itself (usually on the socket of the building etc).

In both cases it is important that the sensors of the instrument are securely connected to the ground or the measurement object. Even a minor slackness in the coupling can introduce false signals due to resonance phenomena.

The applicable norm or contract specifications for your project should stipulate which method to be used. If not, you have to make your own choice, whereby the difference between the two “schools” can be outlined as follows:

- Ground mounting provides an “undisturbed” (“maiden”) vibration signal, not affected by any transfer functions between the ground and the measuring object. In most cases this way of mounting is the easiest, both practically and “legally” (see below).
- Object mounting provides a signal including the transfer function between the ground and the measuring object. In practice, this method requires some more work on site, such as drilling a hole and fastening the instrument with a mounting device

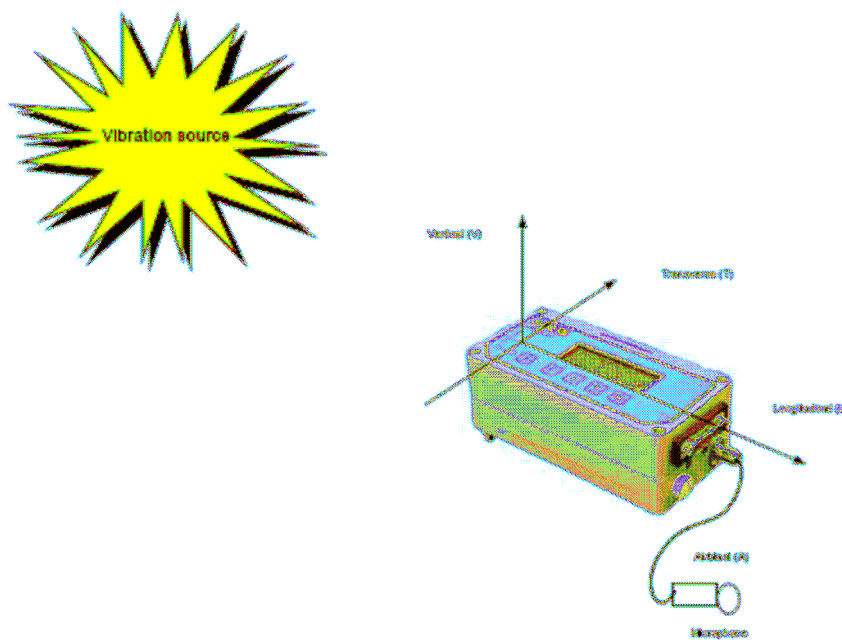
(see 3.12.2). There can also be a “legal” problem to receive the property owner’s permission to enter into his/her premises and to create lasting marks or “damages” on the building or construction

We will not discuss the pros and cons of these two methods here. For this you are advised to refer to the scientific literature. However, some practical guidelines for each method are provided below.

### 11.2.1 Ground mounting

Vibraloc can be placed directly on a horizontal surface. However, in this case the expected maximum acceleration must be well below 1 g (normally <0.2-0.4 g).

When measuring in soil three anchoring spikes (optional) can be used for better coupling to the ground. Alternatively, the instrument can be buried into the ground or secured with sand bags or equivalent.



When measuring on the ground, the established practice is to point the positive direction of the longitudinal (L) channel from the vibration source. This means that you should have the blasting site/object on your left when operating the instrument. The positive directions of the three inbuilt geophones (V, L & T) are defined on the front panel of Vibraloc (see 3.1).

### 11.2.2 Object mounting / Wall mounting

Many national norms stipulate that the sensor(s) shall be mounted on the measuring object, outside on the socket or in the basement if the object is a building. In general terms, with this mounting method the sensor should be located where the vibrations “enter into” the

object, i.e. at the point closest to the vibration source. Further to this, some national norms (e.g. the German DIN 45 669) can stipulate additional measuring points.

For mounting Vibraloc using the optional Wall mounting device (see 3.12.2), follow the instructions below.

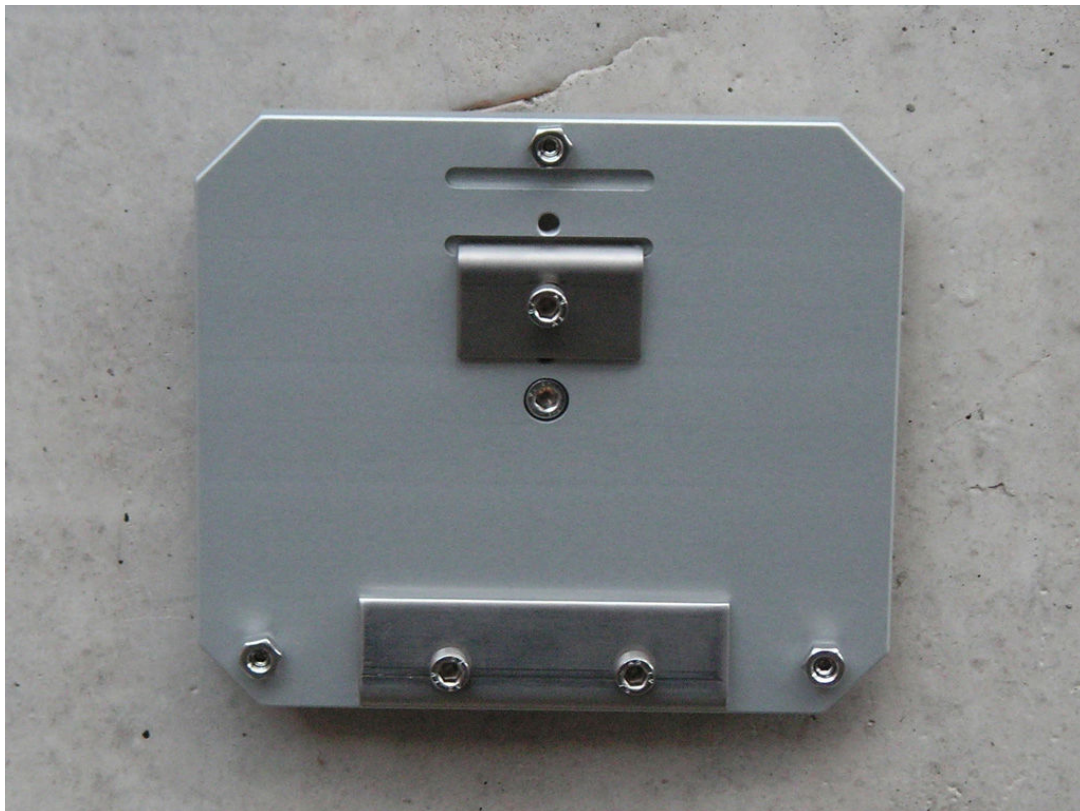
When Vibraloc is mounted on the socket or basement wall of a building, the positive direction of the L channel will be defined by the physical circumstances at the measuring location.

When Vibraloc is mounted on a basement floor, the positive direction of the L channel could be defined as from the blast, or parallel with the longitudinal axis of the building towards the gable farthest from the blast.

### 11.2.3 Wall mounting instructions

- First drill an 8 mm hole on the wall where you wish to measure with your Vibraloc
- Next put a brass anchor 30 mm (38 7000 73) in the hole
- Screw the 3 pc (nubs and nuts) that follow with the instrument on the universal mounting plate (20 3000 15)
- Using an ex wrench 5 mm screw the mounting plate tight to the wall

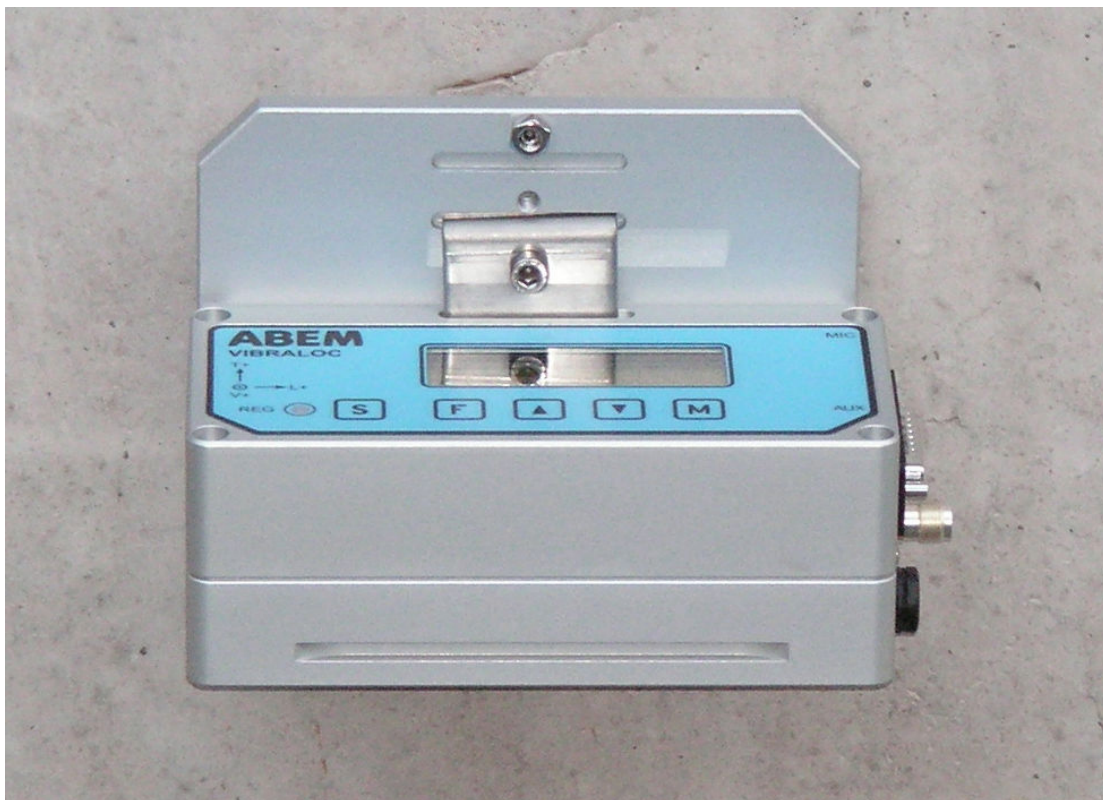
Be aware that the plate should not tilt more than  $\pm 2$  degree.



**Figure 9.** Mounting plate with flanges



- Remove the short flange from the plate
- Loosen the screws on the long flange to make space between the flange and the plate
- Keep the instrument horizontal and mount the bottom trace of the instrument on the long flange
- Insert the short flange in the top trace and screw it to the plate
- Using the hex wrench (5 mm) screw both flanges so the instrument is firmly attached to the wall plate (see Figure 10)



**Figure 10. Vibraloc attached to mounting plate**

For Vibralocs with an extension ring the same procedure can be used but the short flange has to be changed to a smaller one and screwed in the top hole on the plate (see Figure 11)

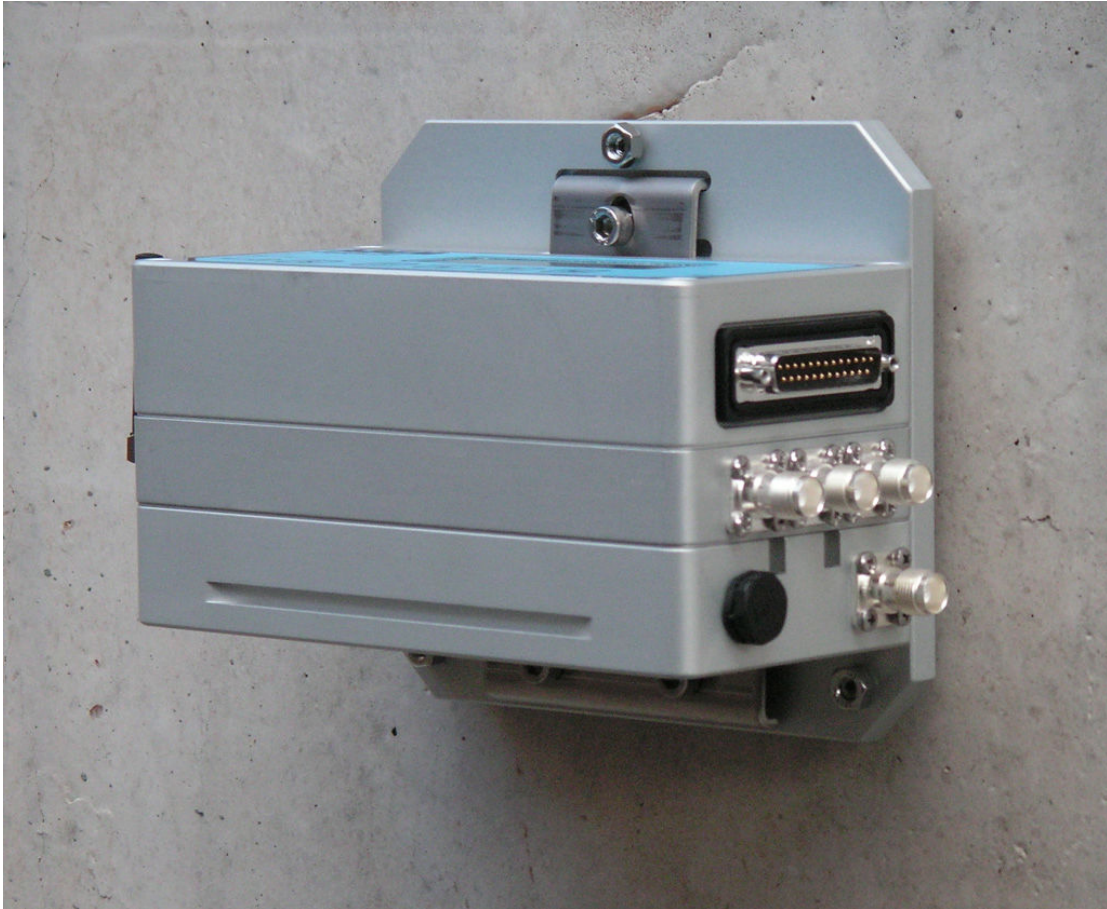


Figure 11. Vibraloc with extension attached to mounting plate

### 11.3 Leveling

It is important that Vibraloc is installed in level,  $\pm 2$  degrees. If too much out of level, the built-in geophones will provide faulty measurement values.

Normally, this leveling accuracy can be achieved by eye, but when in doubt you are advised to use a level instrument.

### 11.4 Protection

Although Vibraloc is designed for use in harsh environments, it should not be unnecessarily exposed to water, dust or extreme temperatures.

In particular the connectors should be protected, and in severe cases it is recommended to cover the instrument with a plastic bag or equivalent.

### 11.5 Restart with monitoring on

The Vibraloc can restart and automatically go to the monitoring on mode. This is useful in the case where the Vibraloc is powered by an external source and this external source fails and then comes back again. This is done when the following conditions are met:

- The Vibraloc is powered by an external source
- Monitoring is on when the power fails

When the power fails the Vibraloc will of course stop. Then when the power returns the Vibraloc will sense that the monitoring was not stopped correctly and so will turn on monitoring automatically.

This function cannot be turned off.

## 12 Air blast measurement

In addition to ground vibrations measured with the three internal geophones, air blast recordings can be made on the fourth channel. For this purpose the optional ABEM weatherproof air blast microphone shall be connected to the MIC connector.

### 12.1 Setting up your Vibraloc for air blast measurement

Make sure that your Vibraloc is properly set for air blast measurement:

- Activate the Air channel (see 6.9).
- Decide whether your Vibraloc shall trigger on the Air channel and, if so, set a trigger level (see 6.2).

### 12.2 Mounting of the air blast microphone

As with vibration monitoring, also air blast recording is ruled by different national norms, and sometimes by specific contract stipulations.



Basically, due to the low frequency content of the air blast wave, the microphone can be mounted close to the ground without the signal being distorted. This means that the microphone can be mounted directly onto the Vibraloc instrument, using the TNC angle adapter provided with the microphone.

Alternatively, the microphone can be mounted to a firm object away from the instrument, whereby a mounting clamp and a TNC cable (optional equipment) between the microphone and the instrument shall be used.



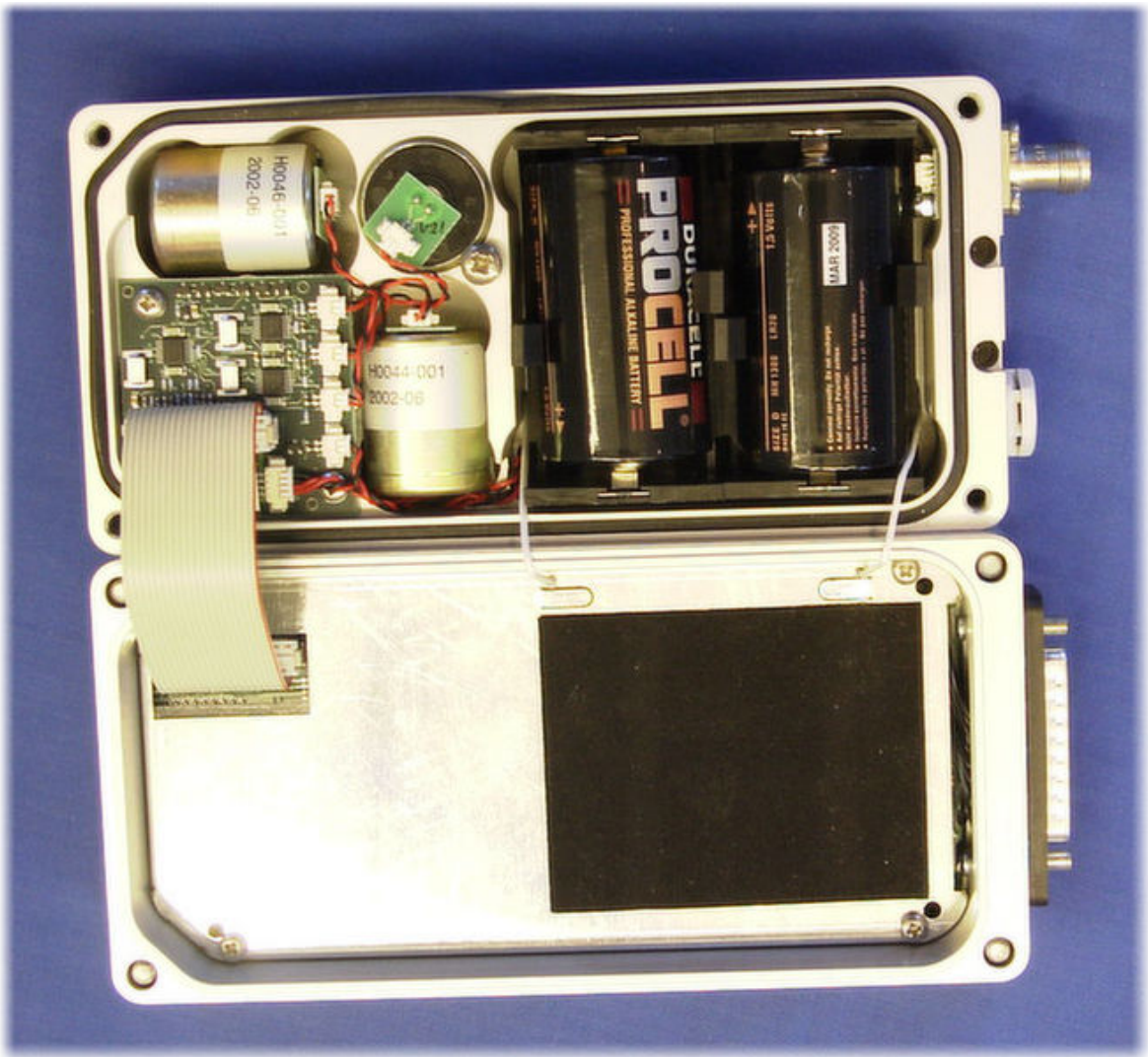
## 13 Maintenance

### 13.1 Battery

Two IEC LR 20 alkaline batteries power the Vibraloc. Please note that only good quality alkaline batteries shall be used. Standard batteries cannot guarantee proper functioning of the instrument (because of too high internal resistance) and are not safe enough with respect to leakage.

The capacity of the two internal batteries is sufficient for up to 3 weeks continuous operation of Vibraloc. For further details, refer to 15.3.

#### 13.1.1 Replacement of batteries



The internal batteries should be replaced when the voltage falls below 1.95 V (see 15.3).

|              |   |
|--------------|---|
| <b>Note!</b> | Vibraloc has a capacitor power backup, which supports the memory and the internal clock for a period of 2 hours, if the batteries are disconnected. |
|--------------|---|

The procedure is as follows:

- If your Vibraloc is in monitoring ON mode (“REG” diode active), press **S**+**F** to turn monitoring off.
- If your Vibraloc is mounted on a wall or similar, it has to be detached according to the instructions for the attachment device.
- In case of dismal weather, dust or other bad conditions, you are advised to take the instrument to a clean and dry place before proceeding.
- Unscrew the four bolts at the corners using the 5 mm hex head key provided with the instrument.
- Lift the upper part of the instrument and fold it towards you.
- Replace the batteries and reverse the above procedure.

### 13.2 Powering Vibraloc from an external source

Vibraloc can also be powered from an external source, which is useful e.g. when long measurement periods are required.

External power can be supplied via the AUX connector. See wiring diagram in Appendix 15.5 for making your own cable.

External power is indicated by “ext” where the battery voltage is displayed.

### 13.3 Cleaning

When cleaning Vibraloc use water and a mild detergent. Although Vibraloc is designed for the harsh conditions on building sites, it is not recommended to expose it to running or deep water.

### 13.4 Storing and Transportation

To maintain the settings of the internal clock it is recommended to have batteries installed at all times (except for the 2 hours covered by the internal capacitor backup, see 13.1.1). However, settings and recorded data will not be lost in case of prolonged lack of power.

Alkaline batteries only shall be used.

When storing Vibraloc, keep it in a dry, cool place.

## 13.5 Calibration

As with measurement procedures, calibration norms differ from one country to another.

The norms vary as to:

- Requirements to be fulfilled (frequency range, accuracy etc).
- How and when (how often) instruments and sensors shall be calibrated.

On delivery Vibraloc is normally calibrated according to the applicable norm in the country where it shall be used, or according to the customer's special requirements.

ABEM offers periodical recalibration of the whole Vibraloc system, i.e. both the sensors and the electronics.

## 14 Vibraloc Xtension

The Vibraloc Xtension is an option that extends the functionality and connectivity of the Vibraloc. The main objectives for these additions are:

- To make the Vibraloc flexible to fulfill different measuring standards
- To add communication capabilities using GSM



Figure 12. Vibraloc with the Xtension part mounted

A Vibraloc with the Xtension is delivered with 4,5 Hz internal geophones and new built-in filters for adapting the instruments frequency range accordingly.

|              |   |
|--------------|---|
| <b>Note!</b> | The Xtension option can only be added to Vibralocs with a serial number higher than 500 |
|--------------|---|

### 14.1 Added Functionality

With the Xtension there is now a choice to use internal or external geophones. The added filters adjust the lower limit of the frequency range to 1, 2 or 4.5 Hz and the upper limit to 80 or 315 Hz.



The use of external geophones makes it possible to fulfil different standards like DIN, US or Scandinavian. These external geophones are of type 4.5 Hz HD and has a resistance across the coil to adjust the geophone sensitivity to 20 mm/s. This value is very common for UVS geophones 20 4120 00 Vertical, 20 4121 00 Horizontal and 20 5125 00 Triaxial.

Using the menu for the Xtension the following filter choices can be made:

- 1) 2 Hz/315 Hz for USBM standard
- 2) 1 Hz/315 Hz for Scandinavian standard
- 3) 1 Hz/80 Hz for DIN standard
- 4) Uncomp. 4.5 Hz, meaning no filter compensation at lower frequencies.

The Xtension has a GSM module built-in. This can be used for two things:

**Sending SMS** This is used to send a SMS to up to 8 mobile phone numbers when a threshold level has been reached. The SMS contains information about the event. See 14.3.2.4 for more about the SMS content.

**Using GPRS (TCP-IP over GSM)** This will be used to send measurement data to an internet-connected server. FTP will be used to perform the upload. This is currently not implemented.

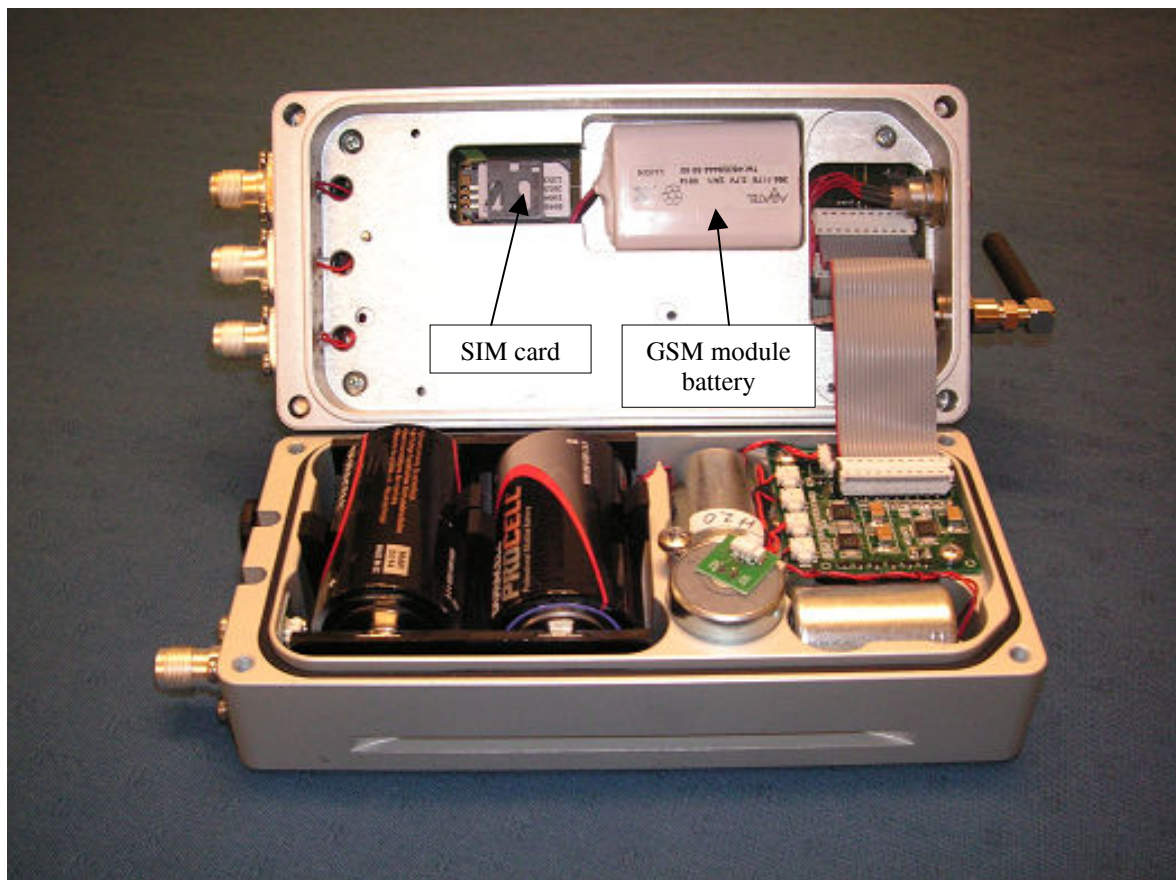


Figure 13. Internal GSM specific parts

## 14.2 Added Connectivity

The Xtension has connections for an external tri-ax geophone and a GSM antenna on one side and connections for individual external geophones on the other side. The figures below show the placement of these connectors.



Figure 14. Connections for external tri-ax geophone and GSM antenna

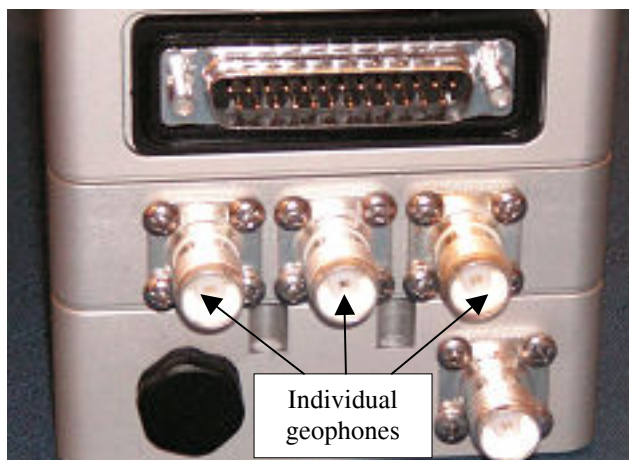
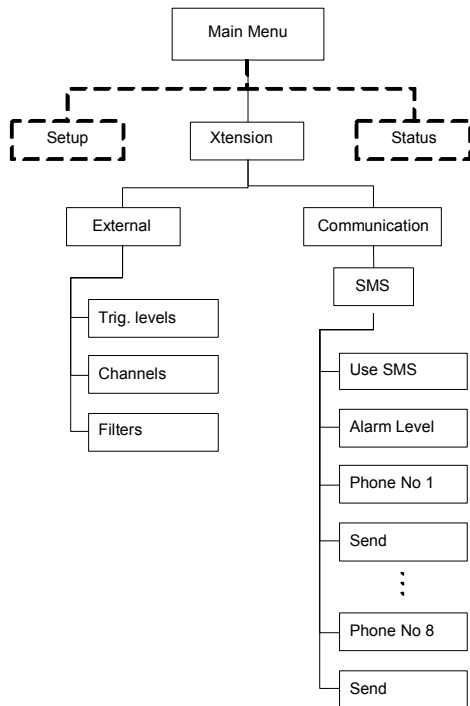


Figure 15. Connections for individual geophones

## 14.3 Menus



**Figure 16.** Added menus for the Xtension part

The Xtension menu is placed between the Setup and Status menus as can be seen in the figure above.

The Xtension Menu has two sub-trees, External and Communication, which are explained in the following text.

### 14.3.1 External menu

The External menu contains the following items, which can be changed by the user in submenus.

```

External
Trigger levels
Channels
Filters
  
```




#### 14.3.1.1 Trigger levels



For general information about trigger levels, see chapter 6.2.





Having selected Trigger levels from the External menu, the following submenu appears:

```
Trigger levels
Trig E1: 3.0mm/s
Trig E2: 5.0mm/s
Trig E3: 5.0mm/s
```

The trigger levels of the E1, E2 & E3 channels can be set from 0.1 to 200 mm/s (0.01 to 8 ips).

To set/change a trigger level, use the  and  keys to select the actual channel and press . The setting menu for the selected channel appears:


```
Set Trig E1:
0.1mm/s
  +/- 1.00
```

To change the trigger level use the  and  keys and press  to confirm the new setting. Pressing  will change the increment used from 1.00 to 0.10 to 0.01 and back to 1.00 again.

#### 14.3.1.2 Channels

In the Channels submenu each channel is set according to the type of sensor used. Any channel that shall not be used must be set to the OFF position.

```
Channels
Ext Ch1: Geophone
Ext Ch2: Geophone
Ext Ch3: Channel OFF
```

The following submenu appears when a channel is selected and  is pressed:

```
Set E1:
Geophone
```

Available options for the E1, E2 & E3 channels are Geophone or Channel OFF.

#### 14.3.1.3 Filters

In the Filters submenu the upper and lower limits of the recorded frequency range is set. The lower limit can be 1, 2 or 4.5 Hz and the upper limit 80 or 315 Hz. The Uncomp setting must be *No* to allow lower limit settings of 1 or 2 Hz. Setting Uncomp to *Yes* sets the lower limit to 4.5 Hz. In this case the 2/1 setting has no influence.

```
Filters
2/1 Hz: 1 Hz
315/80 Hz: 80 Hz
Uncomp.(4.5Hz): No
```

The following submenu appears when 2/1 Hz is selected and **F** is pressed:

```
Set 2/1 Hz:
1 Hz
```

Available options are 1 or 2 Hz.

**Note!** Only use the 1 Hz setting with 4.5 Hz geophones. The result might be incorrect if used with 8 Hz geophones.

The following submenu appears when 315/80 Hz is selected and **F** is pressed:

```
Set 315/80 Hz:
80 Hz
```

Available options are 80 or 315 Hz.

The following submenu appears when Uncomp (4.5Hz) is selected and **F** is pressed:

```
Set Uncomp.(4.5Hz):
No
```

Available options are No or Yes.

### 14.3.2 Communication menu

The Communication menu contains the SMS (GSM) item.

```
Communication
SMS (GSM)
```

The following submenu appears when SMS (GSM) is selected and **F** is pressed:

```
SMS (GSM)
Use SMS: No
Alarm Level
Phone No.1:
Send: Nothing
.
.
.
Phone No.8:
Send: Nothing
```

#### 14.3.2.1 Use SMS sub menu

The following submenu appears when Use SMS is selected and **F** is pressed:

```
Set Use SMS:
No
```

Available options are No or Yes.

#### 14.3.2.2 Alarm level sub menu

The following submenu appears when Alarm Level is selected and **F** is pressed:

```
Alarm Level
Ch V: 1.00mm/s
Ch L: ---
Ch T: ---
Ch A: Channel OFF
Ext. Trigger: OFF
Ch E1: ---
Ch E2: Channel OFF
Ch E3: Channel OFF
```

The alarm levels for the channels are set in the same way as the trigger levels, see 6.2 or 14.3.1.1 for details.

Sensing of external trigger is set by selecting Ext. Trigger and pressing **F**.

```
Set Ext. Trigger:
OFF
```

Available options are OFF or ON.

#### 14.3.2.3 Phone No and Send sub menus

The Phone No and Send menus are connected as pairs, so the setting of each Send menu belongs to the preceding phone number. All of the pairs work the same way so only the first one is shown here.

Selecting Phone No.1 and pressing **F** shows the following sub menu:

```
Set Phone No.1:
```

To change the phone number use the **↑** and **↓** keys. Pressing **F** will step to the next digit to be set up. Finally press **M** to confirm the new setting.

Available options for each digit is 0 to 9 and + and blank (erased digit).

The following submenu appears when Send is selected and **F** is pressed:

```
Set Send:
Nothing
```

Available options are Nothing, Vib. alarm level, Vibration events and Everything.

#### 14.3.2.4 SMS content

Depending on the *Set Send* setting all or parts of the following will be part of a sent SMS:

```
600# 14 TH 05 NOV    (Instr. S/N; Event 14; Day Date Month)
2009 15:27:25;       (Year Time)
VIBRATION
8.87 mm/s 11.3 mm/s (Vertical; Lateral)
17.7 mm/s OFF        (Transversal; Microphone)
```

## 14.4 Settings

See 15.2 for details about the settings and default values for the Xtension part. These settings are only visible when the Xtension option is mounted.

## 15 Appendix:

### 15.1 Technical Specification

Vibraloc has two measuring ranges for each channel. The instrument selects range automatically.

#### 15.1.1 Seismic

The instrument is designed to give a total  $\pm 5\%$  accuracy of the sampled values in the range 15-250 Hz and 1-240 mm/s when using the internal geophones (2%, 1-250 Hz excluding the geophone).

**Note!** Note: The accuracy of the peak value reading is dependent on the sampling rate.

| Range | Metric [mm/s] |       |            | Imperial [ips] |      |            |
|-------|---------------|-------|------------|----------------|------|------------|
|       | Min           | Max   | Resolution | Min            | Max  | Resolution |
| Low   | 0,0           | 26,3  | 0,015      | 0,00           | 1,04 | 0,00058    |
| High  | 26,3          | 240,8 | 0,118      | 1,04           | 9,48 | 0,00463    |

Table 1 Seismic range and resolution data

#### 15.1.2 Air

The instrument is designed to give  $\pm 2\%$  accuracy in the range 1-250 Hz and 0,5-150 Pa excluding the microphone.

**Note!** The accuracy of the peak value reading is dependent on the sampling rate.

| Range | Air [Pa] |      |            | Air [dB] |     |                                      |
|-------|----------|------|------------|----------|-----|--------------------------------------|
|       | Min      | Max  | Resolution | Min      | Max | Resolution                           |
| Low   | 0,1      | 163  | 0,091      | 73       | 138 | 0,1dB above 87dB                     |
| High  | 163      | 1491 | 0,73       | 138      | 157 | 0,1dB above 130dB 0,04dB above 138dB |

Table 2 Air blast range and resolution data



## 15.2 Factory default settings

The Vibraloc has a number of settings stored in flash memory. If this memory is erased the settings will be returned to the factory default values. Below is a list of these settings and their default values.

**Note!** This list is only included as general information. A calibration will change some of these settings, especially the gain settings. Changing one of these values might make the recordings of the instrument incorrect. Other settings, like sampling rate or trigger settings, can of course be changed at will.

| Setting                           | Default Value |
|-----------------------------------|---------------|
| - Duration                        | 0             |
| - Sampling rate                   | 1000          |
| - Histogram keep                  | 0             |
| - Histogram period                | 120           |
| - Sensortype channel 1            | 1             |
| - Sensortype channel 2            | 1             |
| - Sensortype channel 3            | 1             |
| - Sensortype channel 4            | 0             |
| - Device gain channel 1           | 338.0         |
| - Device gain channel 2           | 338.0         |
| - Device gain channel 3           | 338.0         |
| - Device gain channel 4           | 182.0         |
| - Sensor gain channel 1           | 23.46         |
| - Sensor gain channel 2           | 23.46         |
| - Sensor gain channel 3           | 23.46         |
| - Sensor gain channel 4           | 2.0           |
| - Trigger velocity channel 1      | 5.0           |
| - Trigger velocity channel 2      | 5.0           |
| - Trigger velocity channel 3      | 5.0           |
| - Trigger velocity channel 4      | 5.0           |
| - Trigger pressure channel 4      | 10.0          |
| - Trigger velocity unit channel 1 | 0             |
| - Trigger velocity unit channel 2 | 0             |
| - Trigger velocity unit channel 3 | 0             |
| - Trigger velocity unit channel 4 | 0             |
| - Trigger pressure unit channel 4 | 0             |
| - Calibration date                | 61171200      |
| - Calibration reference           | INVALID       |

Vibralocs that are delivered with the optional Xtension will have the following additional settings:

| Setting                           | Value             |
|-----------------------------------|-------------------|
| - Sensor type channel 5           | 0                 |
| - Sensor type channel 6           | 0                 |
| - Sensor type channel 7           | 0                 |
| - Device gain channel 5           | 338.0             |
| - Device gain channel 6           | 338.0             |
| - Device gain channel 7           | 338.0             |
| - Sensor gain channel 5           | 20.00             |
| - Sensor gain channel 6           | 20.00             |
| - Sensor gain channel 7           | 20.00             |
| - Trigger velocity channel 5      | 5.0               |
| - Trigger velocity channel 6      | 5.0               |
| - Trigger velocity channel 7      | 5.0               |
| - Trigger velocity unit channel 5 | 0                 |
| - Trigger velocity unit channel 6 | 0                 |
| - Trigger velocity unit channel 7 | 0                 |
|                                   |                   |
| - SMS Events                      | 0                 |
| - SMS Report Level 1              | 0                 |
| - SMS Report Level 2              | 0                 |
| - SMS Report Level 3              | 0                 |
| - SMS Report Level 4              | 0                 |
| - SMS Report Level 5              | 0                 |
| - SMS Report Level 6              | 0                 |
| - SMS Report Level 7              | 0                 |
| - SMS Report Level 8              | 0                 |
| -                                 |                   |
| - FTP Events                      | 0                 |
| - FTP Hostname                    | ""                |
| - FTP Username                    | ""                |
| - FTP Password                    | ""                |
| - FTP Remote Path                 | /events           |
| - FTP FLAC                        | 0                 |
| - FTP XML                         | 0                 |
| - FTP VP2                         | 0                 |
| - Copy Raw                        | 0                 |
| - Copy Text                       | 0                 |
| - Copy FLAC                       | 0                 |
| - Copy UVSZ                       | 0                 |
| - Copy VP2                        | 0                 |
| - APN                             | maingate.telia.se |

## 15.3 Battery Capacity

By reading the battery voltage in the SETUP menu at normal load, i.e. when the LCD of Vibraloc has been activated for at least 1 minute, you can make a rough assessment of remaining battery capacity.

| Battery voltage [V] | Remaining capacity [%] |
|---------------------|------------------------|
| 3.20                | 100                    |
| 2.50                | 75                     |
| 2.35                | 50                     |
| 2.20                | 25                     |
| 1.95                | 10                     |

The table refers to DURACELL Alkaline Manganese MN-1300 and is based on information supplied by the manufacturer.

Vibraloc has the following battery operation limits installed:

| Battery voltage [V] | “Battery” indication: | Vibraloc action:  |
|---------------------|-----------------------|---|
| 1.95                | Low                   | None  |
| 2.40                | Low disappears        | None  |
| 1.85                |                       | Min for power ON  |
| 1.80                | Low                   | Monitoring OFF  |
|                     |                       | Creates an ERROR STOP event with “Low battery” indication |
| 1.65                | Low                   | Power OFF   |

## 15.4 Event size information

**Note!** These numbers are valid only when histogram recording is of

| Sampling frequency [Hz] | Recording length [s] | Memory size [Bytes] | Transfer time [s] |            |            |            |
|-------------------------|----------------------|---------------------|-------------------|------------|------------|------------|
|                         |                      |                     | 9600 baud         | 19200 baud | 38400 baud | 57600 baud |
| 100                     | 1                    | 800                 | 1                 | 1          | 1          | 1          |
| 100                     | 2                    | 1600                | 2                 | 1          | 1          | 1          |
| 100                     | 4                    | 3200                | 3                 | 2          | 1          | 1          |
| 100                     | 8                    | 6400                | 6                 | 3          | 2          | 1          |
| 100                     | 16                   | 12800               | 13                | 7          | 3          | 2          |
| 100                     | 32                   | 25600               | 26                | 13         | 6          | 4          |
| 100                     | 64                   | 51200               | 52                | 26         | 13         | 9          |
| 500                     | 1                    | 4000                | 4                 | 2          | 1          | 1          |
| 500                     | 2                    | 8000                | 8                 | 4          | 2          | 1          |
| 500                     | 4                    | 16000               | 16                | 8          | 4          | 3          |
| 500                     | 8                    | 32000               | 33                | 16         | 8          | 6          |
| 500                     | 16                   | 64000               | 67                | 34         | 17         | 11         |
| 500                     | 32                   | 128000              | 133               | 66         | 33         | 22         |
| 500                     | 64                   | 256000              | 267               | 134        | 67         | 44         |
| 1000                    | 1                    | 8000                | 8                 | 4          | 2          | 1          |
| 1000                    | 2                    | 16000               | 17                | 8          | 4          | 3          |
| 1000                    | 4                    | 32000               | 33                | 16         | 8          | 6          |
| 1000                    | 8                    | 64000               | 67                | 34         | 17         | 11         |
| 1000                    | 16                   | 128000              | 133               | 66         | 33         | 22         |
| 1000                    | 32                   | 256000              | 267               | 134        | 67         | 44         |
| 1000                    | 64                   | 512000              | 533               | 266        | 133        | 89         |
| 2000                    | 1                    | 16000               | 17                | 8          | 4          | 3          |

|      |    |        |     |      |     |    |
|------|----|--------|-----|------|-----|----|
| 2000 | 2  | 32000  | 33  | 16   | 8   | 6  |
| 2000 | 4  | 64000  | 67  | 34   | 17  | 11 |
| 2000 | 8  | 128000 | 133 | 66   | 33  | 22 |
| 2000 | 16 | 256000 | 267 | 134  | 67  | 44 |
| 2000 | 32 | 512000 | 533 | 1266 | 133 | 89 |
| 2000 | 64 | --     | --  | --   | --  | -- |
| 4000 | 1  | 32000  | 33  | 16   | 8   | 6  |
| 4000 | 2  | 64000  | 67  | 34   | 17  | 11 |
| 4000 | 4  | 128000 | 133 | 66   | 33  | 22 |
| 4000 | 8  | 256000 | 267 | 133  | 67  | 44 |
| 4000 | 16 | 512000 | 533 | 266  | 133 | 89 |
| 4000 | 32 | --     | --  | --   | --  | -- |
| 4000 | 64 | --     | --  | --   | --  | -- |

## 15.5 Wiring diagram for AUX connector

The AUX connector (DB25 connector) can be used for different things:

- Serial connection with a PC
- External trigger
- External power
- External charge of GSM battery

The Vibraloc delivery includes as standard the serial cable 9- to 25-pin D-Sub connector for data transfer to a PC.

Cables for external trigger and for external power supply are optional.

External charger (12V) for the GMS battery is included with the Vibraloc Xtension.

Two or more Vibraloc units can be made to work together by connecting their trigger connectors. The external trigger uses two free pins:

- Pin 11: +3V
- Pin 12: 0

The external trigger connector is a two-way port used for both external triggers out and in signals. The Vibraloc will always indicate a trigger by holding the external trigger out “low” (0V) during event recording. This signal status can be used to trigger other Vibralocs or to start an external alarm unit. The Ext. trigger setting will only control the trigger in function.

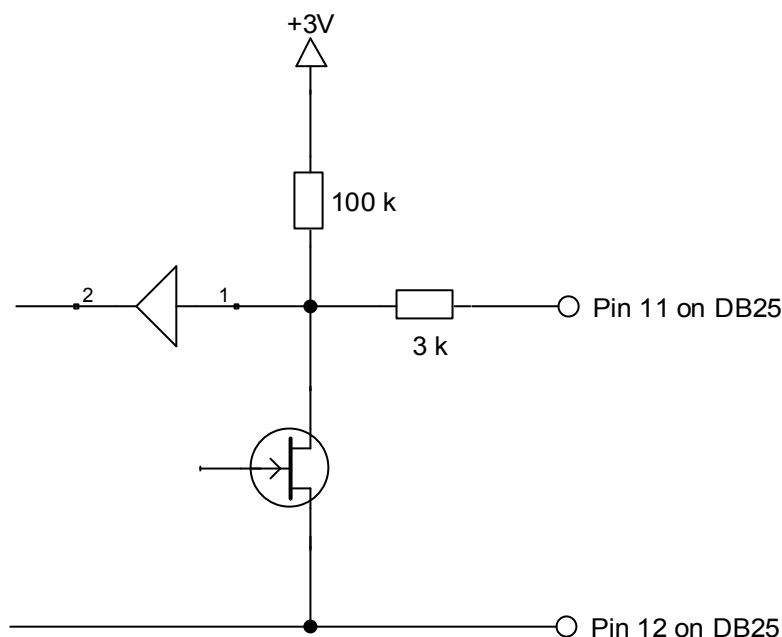
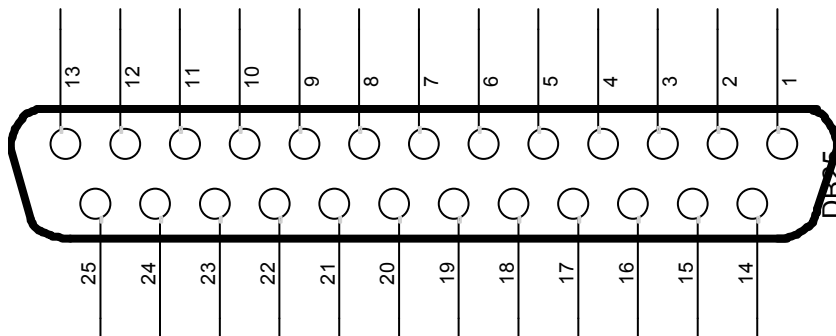


Figure 17. External trigger wiring diagram

Note that the external trigger can be used for other things besides triggering other Vibralocs. It has e.g. been used to set off external alarm units.

The serial connection uses these pins from the RS232 standard:

| Pin | Name                |
|-----|---------------------|
| 2   | Transmit Data       |
| 3   | Receive Data        |
| 4   | Request to Send     |
| 5   | Clear to Send       |
| 6   | Data Set Ready      |
| 7   | Signal Ground       |
| 8   | Carrier Detect      |
| 20  | Data Terminal Ready |
| 22  | Ring Indicator      |



**Figure 18. Standard DB25 pin numbers**