ABEM

A Nitro Consult Company

UVS 1500

Vibration Monitor

User´s Manual

ABEM

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Enclosures

1 General

This manual describes the 4-channel UVS 1500 instrument for monitoring of ground vibrations and airblasts. The instrument is available in **EU**, **DIN**, **SCAND** and **US versions**.

The EU version includes:

- 4 multi-purpose channels for any combination of sensors.

- Alternative sensor kits with 4 vertical Std geophones (V4) or 1 triaxial Std geophone and 1 airblast microphone (TM). However,a variety of other sensors can be supplied on request. Both kits provide geophone response down to 4 Hz, the microphone down to 2 Hz.

The DIN version includes:

- 4 multi-purpose channels for any combination of sensors.

- Alternative 1 Hz, 4 Hz and HUMAN geophone response (user selectable) to comply with the German norm DIN 45669.

- A DIN sensor kit with 1 triaxial HD geophone and 1 vertical HD geophone. However, a variety of other sensors can be supplied on request.

The SCAND version includes:

- 4 multi-purpose channels for any combination of sensors.

- Alternative 1 Hz, 4 Hz and HUMAN geophone response (user selectable) to comply with the Swedish norm SS 460 48 66 and the Norwegian norm NS 8141.

- A SCAND sensor kit with 4 vertical HD geophones. However, a variety of other sensors can be supplied on request.

The US version includes:

- V,L,T channels for geophone measurement 2-250 Hz.

- AIR channel for microphone measurement 2-250 Hz, with user selectable dB (airblast) or dBA (sound) setting.

- A US sensor kit with 1 triaxial HD geophone and 1 airblast microphone (for both dB and dBA measurement).

All versions include:

- Full waveform event recording with

    a)   Compressed memory registration for direct GRAPH presentation on LCD.

    b)   Analysis Quality (sample by sample) memory registration for further processing on PC.

- Recording length can be selected from 1 to 16 seconds.

- Peak value monitoring in 2-minute and 2-second intervals, with 32 days and 8 hours memory capacity respectively. The two monitoring modes operate simultaneously and in parallel with the event recording.

- The peak values can be presented on the LCD as TABLES, BARgraphs or Quick-BARgraphs.

- "On demand" printout of selected events (GRAPHs) or monitoring periods (TABLEs, BARs or Q-BARs) on a direct connected printer emulating IBM Proprinter or Epson.

- Data can be transferred to PC using the **UVS Remote** software (included) or via the **UVS 3601 Disk Drive** (optional). The transfer can be made "on demand" or automatically after each event.

- Further processing on PC of Analysis Quality data is made with the UVSZ software for zooming, scaling and time measurement (included) and the UVSZ Analysis software for filtering, frequency analysis etc (optional).
- Editing/printout of peak value data is made with the UVS Peak software (optional).

- The UVS 1500 is powered by 6 ea LR20 dry batteries, or by 1 ea rechargeable lead-acid battery. Batteries are easily accessible for replacement or service.

- There is also an option for 230 or 115 V connection via a combined charger/adaptor.

- The internal software is accommodated in a flash memory (EEPROM). Updated software versions are available for downloading from ABEM´s homepage www.abem.se.

2 Site Installation; Sensors

Although the UVS 1500 has been designed for the harsh conditions on site, it should not be unnecessarily exposed to water or dust. In particular the connectors should be protected, and in severe cases it is recommended to cover the instrument with a plastic sheet or equivalent.

2.1 Geophones

Particle velocity is measured with Std or HD geophones:

- Std geophones (grey label), to be used with the EU instrument version only, provide a frequency range of 4-80/315 Hz.

- HD geophones (yellow label), provide frequency range 1 or 4-80 or 315 Hz with the DIN & SCAND instrument versions, and 2-250 Hz with the US version.

See Enclosures 2-3 for further details.

Both types are available in four versions:

20 4010 00 Vertical, Std	(grey housing, grey label)	20 4120 00 Vertical, HD	(grey housing, yellow label)
20 4011 00 Horizontal, Std	(red " ")	20 4121 00 Horizontal, HD	(red " ")
20 4012 00 Inverted vert, Std	(amber " ")	20 4122 00 Inverted vert, HD	(amber " ")
20 4015 00 Triaxial, Std	(grey " ")	20 4125 00 Triaxial, HD	(grey " ")
20 4016 00 Triax/Wall Std	(red " ")	20 4126 00 Triax/Wall, HD	(red " ")

The 1-axial geophones use separate attachment blocks (20 5400 00), whereas the triaxial types are integrated blocks.

A combination of 1 vertical and 2 horizontal geophones mounted on an attachment block is technically exactly the same as the corresponding triaxial geophone.

2.2 Mounting of Geophones

To attach a geophone to a hard material wall or floor (concrete or masonry) or to a rock surface, proceed as follows:

- Drill an 8 mm hole with a hammer drill machine. If the material is very hard the hole can be pre-drilled with a 5 mm drill.

- Insert a 30 mm brass anchor (20 8030 00)into the hole.

- Attach the block or the triaxial geophone to the anchor with a hexhead bolt, which expands the anchor when tightened.

It is important that the attachment is firm and stable and the geophone correctly orientated (Std +/-3 degrees, HD +/-1.5 degrees), otherwise the signal amplitude will be affected.

The triaxial geophone can also 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).

For measurement in soil anchoring pegs or spikes can be used.

When placing sensor cables it is important to consider the risk of electrical disturbances. Therefore, all kinds of electrical installations such as cables, motors, household equipment, fluorescent tubes etc should be avoided.

2.3 Microphone

Airblast (and sound; US version only) measurement is made with the 20 4313 00 Microphone (see Enclosure 4).

Using the 20 5616 00 Flexible Mounting Tube it can be mounted directly onto a TNC input connector (normally channel 4) of the UVS 1500.

Alternatively a clamp holder (20 5615 00) or a stand (20 5613 00) and a TNC cable can be used in order to place the microphone away from the instrument.

2.4 Accelerometers

Acceleration can be measured directly with the 20 4520 00 and 20 4530 00 Accelerometers (see Enclosures 5-6).

However, the UVS 1500 provides internal differentiation and integration, why both acceleration and displacement *peak values* for each event can be obtained from a geophone signal.

The UVS Accelerometers are therefore primarily required for *full waveform* recording of acceleration or when very low frequencies can be expected (down to 0.5 or 0.1 Hz respectively).

Accelerometers are mounted in the same manner as the 1-axial geophones.

2.5 Signal Integrator

Full waveform *displacement* can be registered by connecting a 20 3510 00 UVS Signal Integrator (see Enclosure 7) between each geophone and any channel of the UVS 1500. Simultaneous recording of particle velocity from the same geophone can be obtained on a parallel channel.

3 Power Supply

3.1 Batteries

A battery holder with 6 ea dry batteries IEC LR20 (1.5 V, 18 Ah, alkaline), is placed in a separate compartment to the left of the keyboard.

N B: *Always use ALKALINE batteries to ensure maximum function and minimum leakage risk.*

As an option the UVS 1500 can be equipped with a 6 V, 10 Ah rechargeable lead-acid battery set.

To ensure optimum battery function the actual type of battery shall be entered in the **INFO** mode (see chapter 13).

3.2 Battery Charger & Adaptor

A 230 VAC/10.5 VDC battery charger & adaptor is used for charging the lead-acid battery via the **Power** input. The adaptor can also be used to power the instrument directly, whereby the following points should be observed:

N B:	**1.**	***The battery holder must always be connected when the adaptor is used, although no batteries have to be installed.***
	2.	***When using the adaptor with dry batteries installed, it should be observed that new dry batteries have a higher voltage than the adaptor. This means that the instrument will use the dry batteries down to approx 6.5V (20-25% remaining capacity, see Enclosure 8), before it switches over to the mains adaptor.***

The adaptor for the Disk Drive can also be used for external power supply together with dry (or no) batteries, ***but not with the lead battery*** (there is a risk for burning the adaptor).

3.3 Battery Capacity

Under normal temperature conditions 6 alkaline batteries are sufficient for one month of continuous 4 Hz geophone measurement.

The rechargeable battery will last for about 3 weeks.

With sensors like microphones, accelerometers or signal integrators connected, the 1 Hz compensation or the dBA feature activated, the total operation period is reduced, as these sensors require power supply from the instrument.

See Enclosure 1, Technical Specifications, item "Power Supply", and Enclosure 8 for assessment of the battery capacity with various sensor combinations.

3.4 Battery Status

The current battery voltage can be checked at any time in the **INFO** mode (see chapter 13).

The **INFO** mode also includes an Ah-counter for indication of the power consumption since latest reset.

When the battery voltage drops below 5.85 V a **LOW BATTERY** prompt appears on the LCD, indicating that the batteries should be replaced/recharged as soon as possible.

The following approximate battery voltages apply:

- New dry batteries   >8.4 V

- Fully recharged lead acid battery   >6.3-7.2 V

- Battery charger connected; instrument in CHRG mode (see below)   5.2-7.4 V

- Adaptor connected   ≈6.5 V

- **LOW BATTERY** warning   5.85 V

- Transfer to disk not possible (see chapter 14)   <5.65 V

- Auto power-off (REG OFF, LCD OFF)   <5.5 V
  (See chapter 7.1 how this is indicated in CATALOG and TABLE)

- LCD cannot be activated   <5.2 V
  Light Emitting Diod (LED) lights up for about 1 second;
  intensity depending on voltage.

- LED does not light up   <2.5 V

3.5 Replacement of Dry Batteries

Replacement of dry batteries should always be made with the UVS 1500 in **REG OFF** and with the LCD shut down, in order to avoid false registrations in the memory. (However, it is quite normal that the LCD lights up when the new batteries are installed).

3.6 Charging of Lead-Acid Battery

The lead-acid battery can be fully charged using the **CHRG** option in the **INFO** mode:

- Instrument in **REG OFF**.

- Connect the battery charger (***not*** the Disk Drive adaptor, see above) to the **Power** input (see chapter 4).

- Press **LCD** to activate the LCD screen.

- Go to the **INFO** menu (see chapter 13).

- Press the **F3** (**CHRG**) key to start charging. (If no **CHRG** indication is visible above the **F3** key, refer to chapter 13 for setting of **BATTERY TYPE**).

- The LCD shows **CHARGING BATTERY**, including battery voltage and time since charging started. (The backlight is switched off during charging, but the text is still visible).

- If the battery voltage does not increase properly, the message **NO CHARGER?** appears, indicating that the charger is not connected or has no power supply.

- Complete charging of a discharged battery takes 14 hours.

- After 20 hours the instrument switches automatically to standby charging (the LCD shows **CHARGE COMPLETED**).

- Press **F5** (**EXIT**) if you want to leave the charging program (before 20 hours) and return to standby charging.

- Standby charging works also in **REG ON** mode.

- The battery cannot be overcharged in standby mode, and the charger can therefore be connected to the instrument for any length of time.

3.7 Backup Battery

The UVS 1500 has a separate backup battery for the memory and the clock. Also the backup battery can be checked in the **INFO** mode, and should be replaced (by service personnel) when lower than 2.5 V.

N B: *The backup battery has a life exceeding 10 years when used only for limited periods, but just over 1 year if permanently engaged.*   *It is therefore recommended to keep the main batteries installed, or the battery charger connected, when the UVS 1500 is stored for longer periods.*   *It is also recommended to check the battery status at regular intervals, e g every third month.*

4 Connectors & Cables

4.1 Signal Input

The UVS 1500 has an input panel located at the right hand side of the instrument.
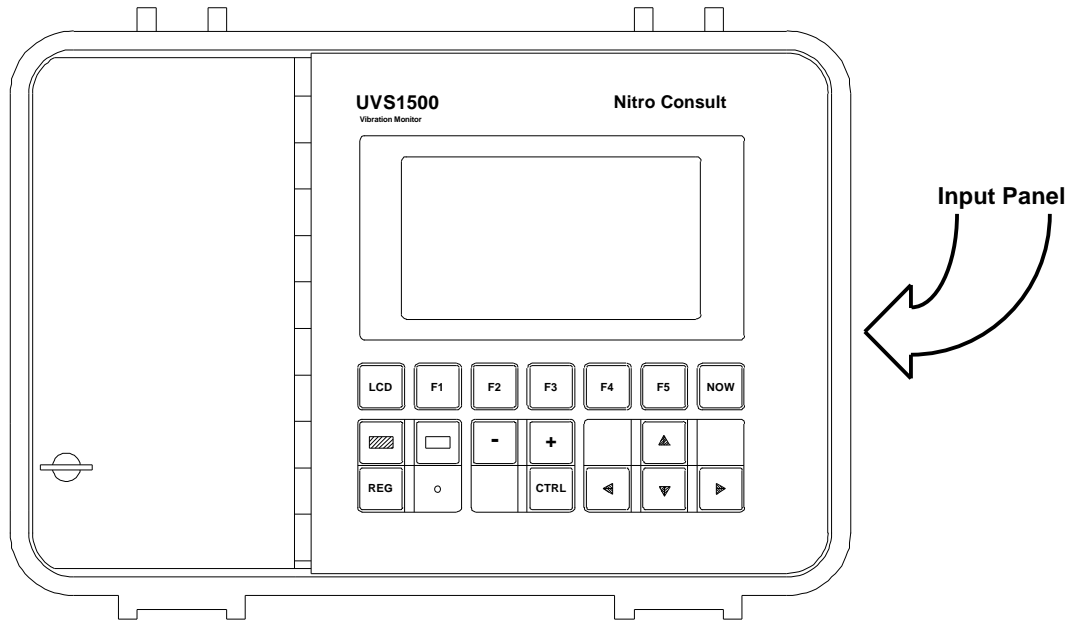
Figure 4.a

The panel has two types of signal input connectors:

- An AMP connector (Ch 1-4) for a triaxal geophone or a sampling cable (see below) for single channel sensors.

- 4 ea TNC connectors (Ch 1 to Ch 4) for single channel sensors.
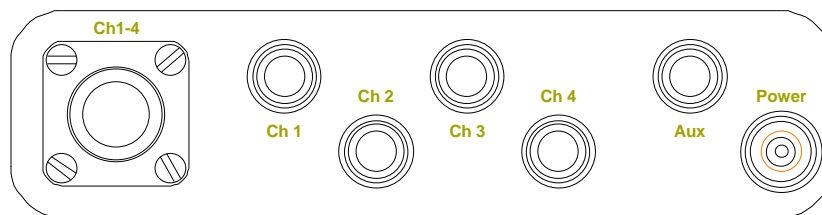
Figure 4.b

When a triaxial geophone is connected, the TNC connector for Ch 4 is still available for a microphone, accelerometer, single channel geophone etc.

With a coupling box (20 5314 00), an AMP cable can be used as a sampling cable for 1-4 TNC cables. In this case also Ch 4 is connected via the AMP input.

N B:	*Channels not used shall be in* **OFF** *position (see chapter 12), otherwise there is a risk for false triggerings and registrations.*

4.2 Power

The input panel also has a separate 10.5 VDC **Power** input (5.5/2.5 mm Japanese standard connector, center pin +) for battery charging and/or external power supply to the instrument (see chapter 3).

4.3 Aux

The **AUX** connector (TNC type) on the panel provides three user selectable functions:

- **5 VDC output**, which can be used for power supply of special sensors etc.

- **ALARM**, which provides a 5 VDC (max 100 mA) signal during a number of seconds (depending on preset *recording* length) when the trigger level has been exceeded (see chapter 6). This signal can be used to close a relay of an external alarm system.

- **TRIG/SYNC**, which can be used for external triggering and/or syncronizing of several UVS 1500 instruments.

  External triggering is initiated by contact closure.

  By connecting several UVS 1500 instruments (using three-way T-adaptors if more than two instruments), all instruments will trigger simultaneously.They will then function as one multi-channel instrument.

See chapter 12 for selection of the **AUX** function.

4.4 RS-232

An RS-232 (serial) port for data communication is located inside the battery compartment. See chapter 14 for further information.
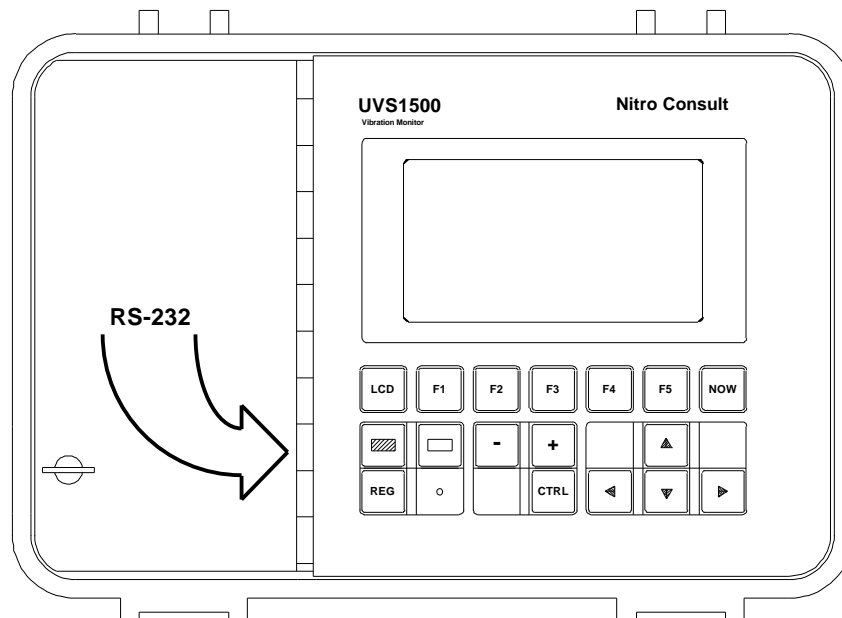
Figure 4.c

5 LCD Presentations

5.1 LCD On/Off

- Use the **LCD** key to activate or shut down the LCD screen.

- The LCD shuts down automatically 2 minutes after the latest pressing of any key.

5.2 Contrast

- Use the ▬ and ▭ keys to adjust the LCD contrast.

5.3 Presentation Modes

The UVS 1500 provides the following LCD presentation modes, which are described in chapters 7 to 14:

- **CATALOG:** An overview of all events in the memory.

- **GRAPH:** A standard report for each event.

- **TABLE:** A table of 2-minute peak values selected by threshold criteria.

- **BAR:** A bargraph of 2-minute peak values.

- **Q-BAR:** A "quick"-bargraph of 2-second peak values.

- **SETUP:** Setup for a specific measurement session.

- **INFO:** General information and setup.

- **OUTPUT:** Data output to printer, disk drive and PC.

5.4 Default Presentation

In the **INFO** mode (see chapter 13) you can select any of the **CATALOG, GRAPH, TABLE, BAR** or **Q-BAR** modes to appear as default, i e every time the LCD is activated.

5.5 Change Presentation

- Press the appropriate function key (**F1** to **F4**) below the name of the desired presentation mode on the menu line at the bottom of the LCD.

- If the desired presentation cannot be found, press **F5** (**NEXT**) to display a new menu line.

6 Recording

6.1 Switch Recording On

- Press **LCD** to activate the LCD screen.

- Press **CTRL** + **REG** simultaneously, whereby the LED (Light Emitting Diod) to the right of the **REG** key lights up.
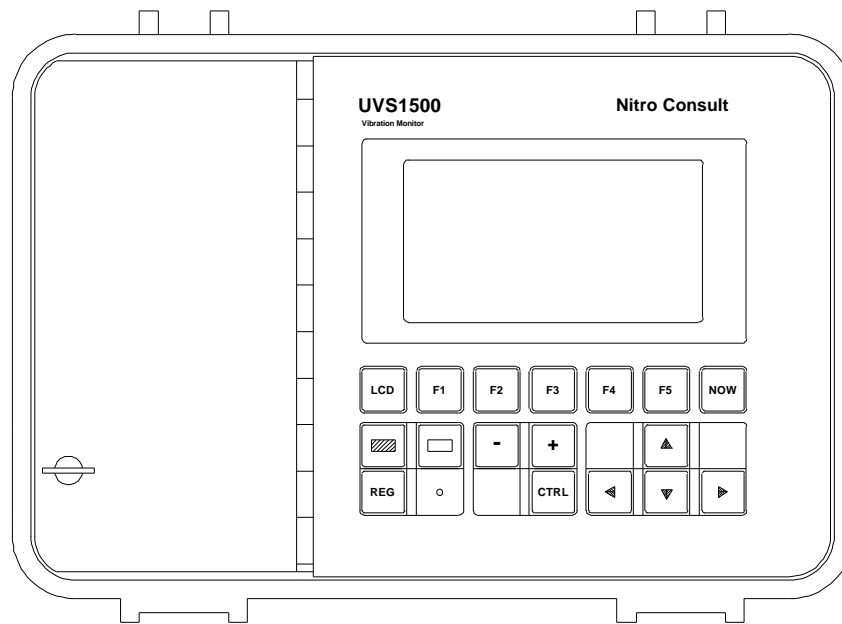
Figure 6.a

- After about 20 seconds the LED changes to flashing. The UVS 1500 is now scanning the incoming signals, comparing them with the preset trigger levels (see chapter 12).

- Simultaneously, peak values are detected, updated and stored in 2-minute and 2-second intervals.

6.2 Triggering of Event Recording

- If the trigger level of any channel is exceeded, an event recording starts in all connected channels. This is indicated by a steady light of the LED.

- It is also possible to trigger manually by holding down **REG** while pressing **NOW**.

    There is no indication in the registered data whether a particular event was triggered automatically or manually.A manually triggered event can therefore have recorded levels below the trigger level.

- Recording & data capture takes between 0.5 and 2 minutes depending on preset recording length (see chapter 12).

- Scanning has been resumed when the LED goes back to flashing again.

- Peak value monitoring goes on all the time.

Each event is stored both as a full waveform GRAPH image (bitmap file) with corresponding alfanumeric data (see Enclosure 11), and as Analysis Quality data (sample by sample) for further processing on PC.

A pretrigger feature adds an initial 0.1-0.5 second time element (depending on preset recording length) to the recording sequence.

N B:	**1.**	*If a higher signal occurs during the data capture period, the 2-minute & 2-second peak values will be higher than the corresponding ppv in the GRAPH recording.*
	2.	*Peak values of event recordings are sometimes lower than the corresponding 2-minute & 2-second values. The reason is that the sampling frequency of the event recording depends on the recording length (see Enclosure 1, Processing, Storage and Display), whereas the 2-minute & 2-second recordings have a fixed sampling frequency (2000 or 4000 Hz, depending on version).*

6.3 Interrupt Event Recording

If the instrument has triggered by mistake, it can be brought back to scanning as follows:

- Hold down **CTRL** and press **F1** simultaneously until the message **EVENT INTERRUPTED** appears on the LCD.

- The UVS 1500 returns to scanning and the interrupted event is erased (although the peak value is registered *in the 2-minute & 2-second memories*).

6.4 Switch Recording Off

- Press **LCD** to activate the screen.

- Press **CTRL** + **REG**, whereby the LED shuts down.

- If event recording is in progress (the instrument has triggered) the two keys must be held down until the message **REG OFF REQUESTED** appears on the LCD.

7 CATALOG

The **CATALOG** mode provides a list of all events stored in the memory, as well as of every **REG ON** and **REG OFF.**


```
EVENT  DATE           TIME

#337   E WE 26 JAN 2000 16:41:54          BE82
#338   E WE 26 JAN 2000 16:42:43          B0E0
#339   E WE 26 JAN 2000 16:43:24          B1C0
#340   E WE 26 JAN 2000 16:44:05          B2A0
 OFF     WE 26 JAN 2000 16:44:23 LAST     B380



CATALOG
GRAPH                                     EXIT
```

Figure 7.a   *The CATALOG*

7.1 Event Storage Capacity

The UVS 1500 stores up to 80 full waveform GRAPHs. The number can be slightly reduced if there are many **REG ON/REG OFF** inbetween.

In addition, the UVS 1500 stores events as Analysis Quality data (sample by sample) with the following capacity:

- 80 1-second events,

- 40 2-second events,

- 20 4-, 8-, or 16-second events,

or any combination thereof.

When a new event is recorded, the oldest recording(s) will be erased.

Each event which is still stored as Analysis Quality data (this data will be erased before the corresponding GRAPH if the memory contains registrations longer than 1 second) is marked with an **E**.

Each event for which Analysis Quality data has been copied to PC or disk (see chapter14)
is marked with a **D**.

If the battery voltage goes too low (5.5 V) or falls out completely, the UVS 1500 switches off automatically. The resulting **OFF** event is marked by a **B** (controlled switch-off) or a **b** (forced switch-off) respectively.

7.2 Select an Event for Presentation

- Select the desired event by moving the inverted text with the ▲ and ▼ keys.

- For instant return to **LAST EVENT** press **NOW**.

- Press **F1** to display the selected event in **GRAPH** mode (see chapter 8).
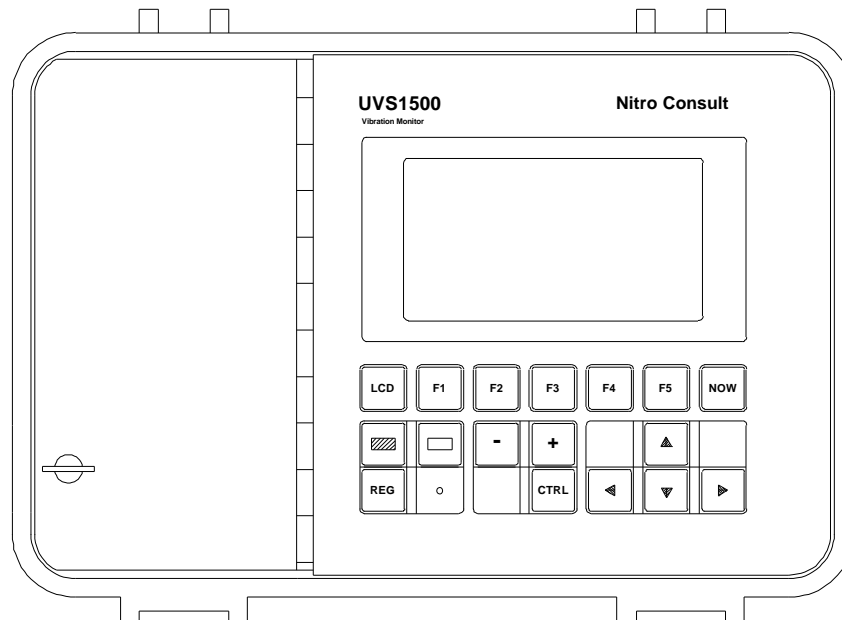
Figure 7.b

7.3 Return from CATALOG to Previous Mode

- Press **F5** (**EXIT**).

- The presentation returns from **CATALOG** to the previous **GRAPH**, **TABLE**, **BAR** or **Q-BAR**
  presentation mode.

7.4 Print CATALOG

- Press **F4** (**PRINT**) to print the complete **CATALOG** on a printer connected to the RS-232 port (see
  chapter 13 for selection of printer).

8 GRAPH

In **GRAPH** mode the LCD provides a full waveform image (see Figures 8.b to 8.f) of each event stored in the memory. The entire GRAPH image can also be output to a printer (see chapter 14 and Enclosure 10).

Also all **REG ONs** and **REG OFFs** are also stored as **GRAPH** events, although they contain only **HEADING** and **SENSOR TEST** data (see below).

8.1 Moving in GRAPH Mode

- Use the ▲ and ▼ keys to scroll through the image.

- Press **CTRL** +   or **CTRL** +   to leap between the various sections of the image (**HEADING**, **WAVEFORM**, **SENSOR TEST** and **PPV/ZX PLOT**).

- Press **CTRL** + ▼ or **CTRL** + ▲ to leap to next or previous event. (A more direct way of selecting a particular event is from the **CATALOG** mode, see chapter 7).
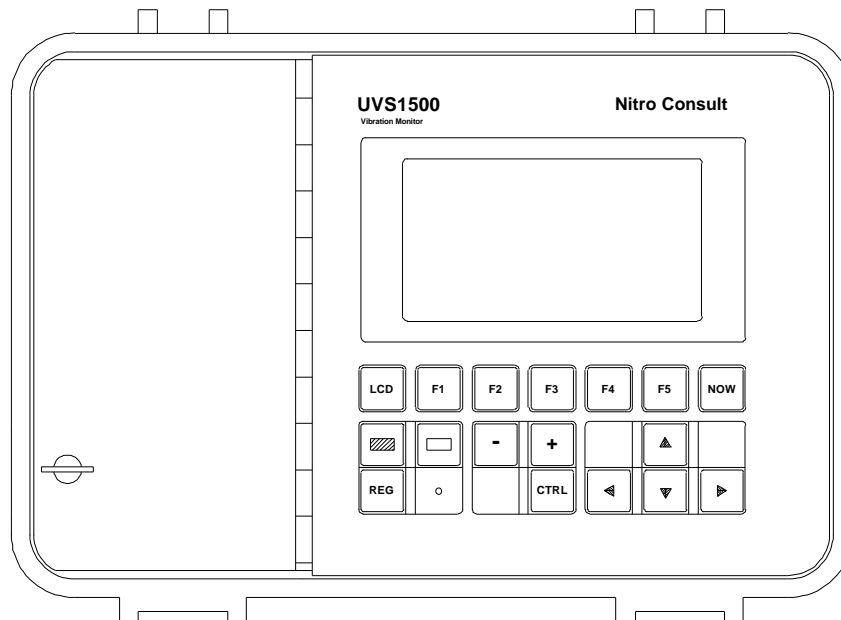
Figure 8.a

8.2 The HEADING Section

Figure 8.b   *The HEADING section*
                    EU & DIN versions

The HEADING section
US version

The **HEADING** section provides the following information:

INSTRUMENT S/N	Serial Number
EVENT #	Events are numbered from 000 to 999
DATE & TIME	When the event was recorded
UNIT CH	EU, DIN & SCAND versions (see chapter 12)
TRIG LEVEL CH	-"- -"-
SEISMIC TRIG LEVEL	US version -"-
AIR TRIG LEVEL	-"- -"-
REG LENGTH	Recording length in seconds, preselected for this event (see chapter 12)
PEAK/PPV	Peak Value/Peak Particle Velocity for each channel (EU & DIN/US version respectively)
DIFF/PPA	Peak Differential/Peak Particle Acceleration for each channel (EU & DIN/US version respectively)
INTEG/PPD	Peak Integral/Peak Particle Displacement for each channel (EU & DIN/US version respectively)
FRQ	Frequency at peak, calculated with the Zero Crossing (ZX) method, whereby the time difference between the two zero crossings on each side of the peak half-wave represents 2 x FRQ
VECTOR MAX/RPPV at X.XXX s	Vector Max/Resultant Peak Particle Velocity of channels 1-3/V,L,T (EU, DIN & SCAND/US Version respectively) and corresponding time in seconds from TRIG
PEAK AIR	US Version only

8.3 The WAVEFORM Section

GRAPH SCALE　20. mm/s　　20.Pa TIME SCALE　0.1 s/div 　　V　　L　　T　　Air	TIME SCALE　0.1 s/div GRAPH SCALE 　20.mm/s　5.mm/s　5.mm/s　20.Pa 　1　　2　　3　　4
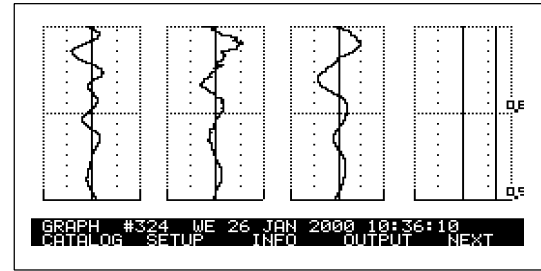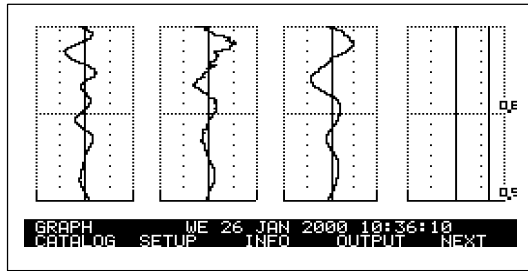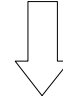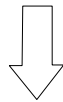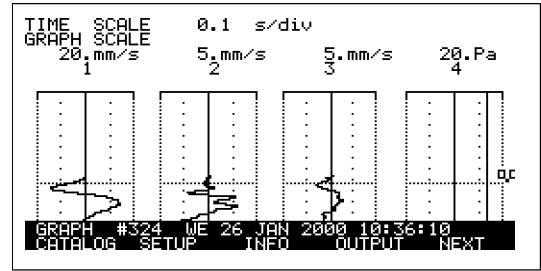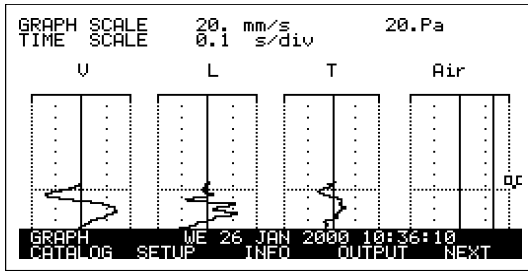
Figure 8.c　　　　*The WAVEFORM section*　　　　*The WAVEFORM section*
　　　　　　　　EU, DIN & SCAND versions　　　　　*US version*

The **WAVEFORM** section starts with scale information:

TIME SCALE	Indicates the time interval between each horizontal grid line. The figures to the right of the WAVEFORM indicate the time from TRIG
	The TIME SCALE is automatically adjusted depending on preset REG LENGTH. The total length of the WAVEFORM diagram is therefore always the same
GRAPH SCALE	Indicates the signal amplitude (measurement value) corresponding to the vertical grid lines on each side of the zero line of the respective channel
	The GRAPH SCALE is automatically adjusted to the respective max amplitude (peak value) of each channel

The waveform GRAPH always has the same length, i e the time scale is adjusted to the REG LENGTH.

8.4 The SENSOR TEST
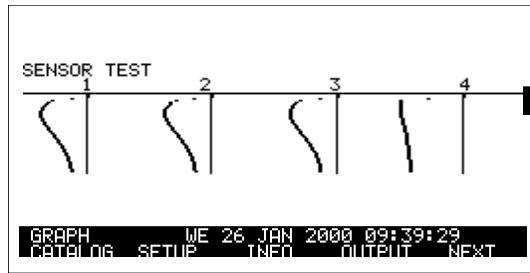
Figure 8.d   *The SENSOR TEST*
                                      Geophones in Ch1-3
                                      Microphone in Ch4

An automatic sensor test is carried out at **REG ON** and every night at 02:00 hours.

A voltage is applied to each channel and when released the sensor response is recorded.

N B: *The test at night makes the instrument unable to record incoming signals for about 1 minute.*

Although primarily designed for geophones, this test also gives significant signatures for other types of sensors, see Figure 8.e.

If the actual response does not correspond with the typical signature, the sensor should be checked/calibrated.
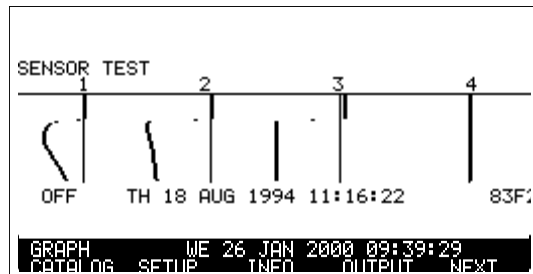
Figure 8.e   *SENSOR TEST signatures*

Ch1: Geophone
Ch2: CCS Sensor (microphone, accelerometer etc)
Ch3: Open channel
Ch4: Short Circuit

8.5 The PPV/ZX PLOT:
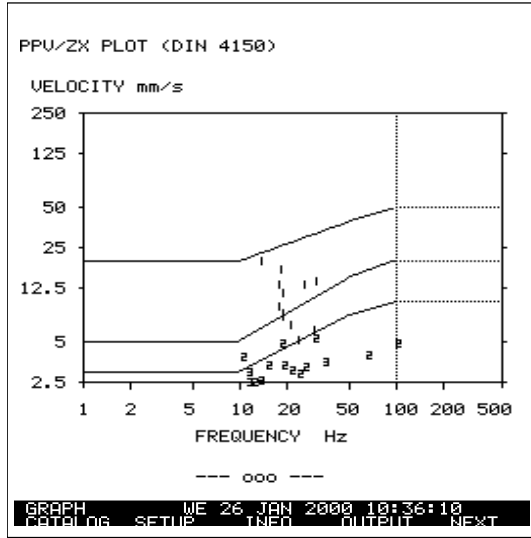
Figure 8.f   *The PPV/ZX plot*   *The PPV/ZX plot*
EU, DIN & SCAND versions   *US version*
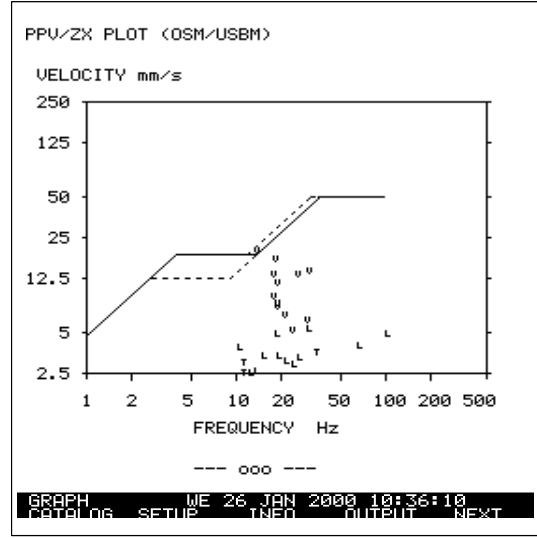
The 12 highest peak values of each velocity channel (**UNIT mm/s** or **ips** selected in **SETUP**, see chapter 12) are plotted against their respective ZX (Zero Crossing) frequencies.

If less than 12 plots can be found, the missing ones have frequencies or amplitudes above/below the chart borders.

The criteria of the German Norm DIN 4150 are provided with the EU, DIN & SCAND versions, and those of the OSM/USBM (Office of Surface Mining/US Bureau of Mines) with the US version. Other norms can be provided as options.

To comply with the norm, all plotted values shall be below the line referring to the actual type of structure.

9 TABLE

In the **TABLE** mode, peak values of all 4 channels are presented in 2-minute intervals.


```
                              1        2        3        4
                            mm/s     mm/s     mm/s      Pa

WE 26JAN 11:07    START   ---------------------------------
WE 26JAN 11:07            0.15     0.4      0.2      0.05
WE 26JAN 11:09            0.1      0.15     0.2      0.2
WE 26JAN 11:11            0.1      0.15     0.2      0.05
WE 26JAN 11:11            0.1      0.15     0.2      0.05
WE 26JAN 11:13            0.1      0.15     0.2      0.05
WE 26JAN 11:15            0.1      0.15     0.2      0.2
WE 26JAN 11:15    STOP    ---------------------------------

THRESHOLD:                 0.       0.       0.       0.
TABLE
CATALOG   SETUP     INFO      OUTPUT     NEXT
```

Figure 9.a   The TABLE presentation
                              With no thresholds applied

The peak values are registered in parallel with (and independantly of) the triggered events in the **GRAPH** mode.

The memory capacity is 32 days of continuous measuring. The oldest information is gradually replaced by the newest. For safety reasons the memory cannot be erased.

The readings of the current 2-minute interval are updated every 2 seconds.

9.1 Reading TABLE

- If required press **F5** (**NEXT**) until the **TABLE** option is displayed on the menu line at the bottom of the LCD.

- Press **F2** to activate the **TABLE** mode.

- A table with the 10 latest 2-minute values, which exceed (any of) the selected threshold(s), see below, appears on the LCD.

- If **REG** is **ON**, the current (unfinished) 2-minute interval (marked with an asterisk *) shows values, even if none of these values exceed their thresholds.

- Use the ▲ and ▼ keys to scan through the memory.

- Press **CTRL** + ▲ or **CTRL** + ▼ to leap 24 hours at a time.

- Press **NOW** to return to the latest registrations.

9.2 Thresholds

The operator can select registered values for presentation by using channel-by-channel threshold criteria. Values are then displayed only when on or above the threshold of any channel.

Thresholds are set as follows:

- Select a channel by pressing **CTRL** + or **CTRL** + .

- Set the desired threshold value using the **/–/** and **/ /** keys (2-digit resolution).

- New threshold values are confirmed (and applied on the presentation) when you move the selection (inverted field) out of the image with **CTRL** + or **CTRL** + , or when you start scanning with ▲ or ▼.

- **CTRL** + **/ /** or **CTRL** + **/–/** provides instant switch between selected thresholds and thresholds = 0.

```
                      1      2      3      4
                    mm/s   mm/s   mm/s    Pa




WE 26JAN 10:35  START ---------------------
WE 26JAN 10:35  21.1   5.75   3.8    14.1
WE 26JAN 10:37   0.5   0.6    0.3    14.05
WE 26JAN 10:37  STOP ----------------------

THRESHOLD:       0.2    0.2    0.2    0.5
TABLE
CATALOG  SETUP    INFO   OUTPUT   NEXT
```

Figure 9.a   *The TABLE presentation*
                            with thresholds applied

10 BAR

The **BAR** mode provides 4 parallel bargraphs (strip charts, histograms) of the same 2-minute peak values presented in **TABLE** .
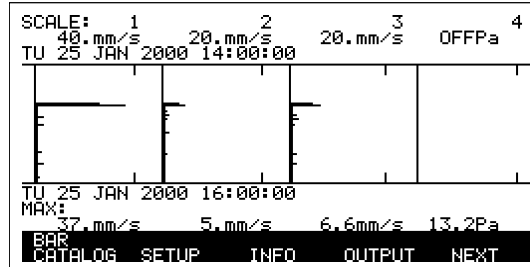
Figure 10.a   The BAR presentation

10.1 Reading BAR

- If required press **F5** (**NEXT**) until the **BAR** option is displayed on the menu line at the bottom of the LCD.

- Press **F3** to activate the **BAR** mode.

- A bargraph with a 2-hour timewindow (i e 60 bars can be observed at a time) appears on the LCD.

- Use the ▲ and ▼ keys to scan through the memory.

- Press **CTRL** + ▲ or **CTRL** + ▼ to leap 24 hours at a time.

- Press **NOW** to return to the latest registrations.

10.2 Scales

To provide maximum readability the scale can be adjusted for each channel individually.

- Select a channel by pressing **CTRL** +   or **CTRL** +   .

- Adjust the scale of the highlighted channel with the **/   /** or **/–/** keys.

- To remove the highlight press **CTRL** +   or **CTRL** +   , or start scanning via ▲ or ▼.

11 Q-BAR

The **Q-BAR** ("quick-bar") mode provides the same type of histograms as **BAR**, although with the following differences:

- Values are stored in 2-second intervals and displayed in a 2-minute timewindow.

- The memory capacity is 8 hours, with the oldest information gradually replaced by the newest.

- The **Q-BAR** recording runs in parallel with, and independently of **TABLE**/**BAR** and **GRAPH**.
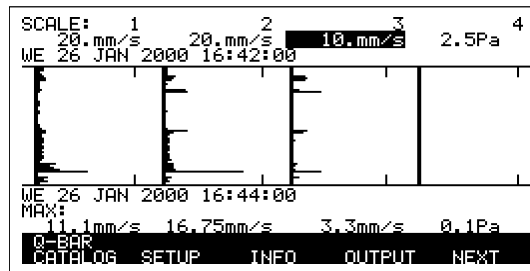
Figure 11.a   *The Q-BAR presentation*

11.1 Reading Q-BAR

- If required press **F5** (**NEXT**) until the **Q-BAR** option is displayed on the menu line at the bottom of the LCD.

- Press **F4** to activate the **Q-BAR** mode.

- A bargraph with a 2-minute timewindow (i e 60 bars can be observed at a time) appears on the LCD.

- Use the ▲ and ▼ keys to scan through the memory.

- Press **CTRL** + ▲ or **CTRL** + ▼ to leap 1 hour at a time.

- Press **NOW** to return to the latest registrations.

11.2 Scales

As in **BAR** the scale can be adjusted for each channel individually.

- Select a channel by pressing **CTRL** +   or **CTRL** +   .

- Adjust the scale of the highlighted channel with the **/ /** or **/–/** keys.

- To remove the highlight press **CTRL** +   or **CTRL** +   , or start scanning via ▲ or ▼.

12 SETUP

In **SETUP** mode you should enter the basic data for your next measurement session.

- If required press **F5** (**NEXT**) until the **SETUP** option is displayed on the menu line.

- Press **F2** to activate the **SETUP** mode.

- Select the **SETUP** item you want to change using the ▲, ▼, and keys.

- Adjust the selected item with the **/＋/** and **/–/** keys.

12.1 Settings in the EU, DIN & SCAND Versions

```
CHANNEL:        1     2     3     4
INPUT:         GEO   GEO   GEO   CCS

FILTER:        315 Hz 315 Hz 315 Hz 315 Hz

SENSITIVITY:   20.0  20.0  20.0  2.00
(mV/Unit)

UNIT:          mm/s  mm/s  mm/s  Pa
RANGE (Units): 250.  250.  250.  2500.
TRIG  (Units):   5.    5.    5.   OFF

REG LENGTH:    1 s        AUX:  5VDC

SETUP          Push F1 (SAVE) to confirm
SAVE                                 EXIT
```
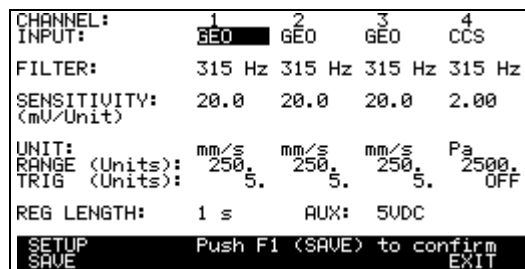
Figure 12.a   *The SETUP menu*
EU, DIN & SCAND versions

INPUT:	**GEO**	For Std and HD geophones. Includes continuous automatic offset correction.
	CCS	Constant Current Supply to the signal cable: For microphone, accelerometer etc. Includes continuous automatic offset correction.
	GEO DC	Same as **GEO**, but without automatic offset correction. For sensors with separate power supply.
	OFF	For channels not in use (to avoid false recordings).
COMPENSATION: (DIN version only)	**1 Hz**	Geophone compensation down to 1 Hz according to DIN 45669.
	HUMAN	Geophone compensation "KB-F" according to DIN 45669 or SS 460 48 66 respectively.
	OFF	No compensation, i e the geophone measures down to 4 Hz.

> **N B: The compensation requires HD geophones (yellow label) to provide correct low frequency results.**

FILTER:	Lowpass filter 80 or 315 Hz.
SENSITIVITY (mV/Unit):	To be set according to actual sensor: Normally 20 mV/mm/s and 2 mV/Pa (see Enclosures 2-7).
UNIT:	To be set according to actual sensor: Normally mm/s and Pa (see Enclosures 2-7).

RANGE:		Measurement range resulting from the **SENSITIVITY** setting; can here be altered by a factor 10.
TRIG:		Trigger level for each channel: 0.2 to 80% of **RANGE**, providing a total span of 0.05 to 200 mm/s with standard geophones. Trigger **OFF** appears "below" 0.2 or "above" 80%.
REG LENGTH:		1, 2, 4, 8 or 16 seconds.
AUX:	DC OUT	5 VDC output for power supply (see chapter 4).
	ALARM	5 VDC output for alarm purposes (see chapter 4).
	TRIG/SYNC	Remote control/syncronizing of several instruments (see chapter 4).

N B: *New settings must be confirmed via* **F1** (**SAVE**), *otherwise the previous settings will remain.*

12.2 Settings in the US Version

```
REG LENGTH:          1 s
SEISMIC TRIG LEVEL:    5. mm/s
AIR TRIG LEVEL:       OFF Pa    OFF dB
SEISMIC RANGE:       0.05-250 mm/s




SETUP      Push F1 (SAVE) to confirm
SAVE                          EXIT
```
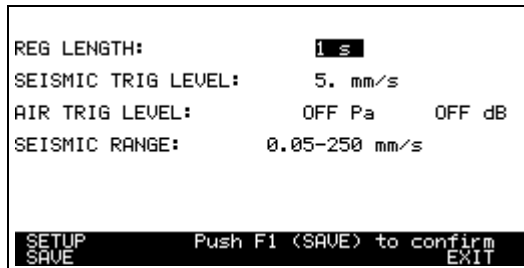
Figure 12.b   *The SETUP menu*
                                 US version

SEISMIC TRIG LEVEL:	Trigger level for V,L,T-channels. Unit **ips** or **mm/s**.
AIR TRIG LEVEL:	Trigger level for AIR channel. Unit **psi & dB** or **Pa & dB** or **dBA** (only).
REG LENGTH:	1, 2, 4, 8 or 16 s.
SEISMIC RANGE:	0.05-250 mm/s 0.002-10 ips or 0.005-25 mm/s 0.0002-1 ips.

N B: *New settings must be confirmed via* **F1** (**SAVE**), *otherwise the previous settings will remain.*

13 INFO

The **INFO** mode provides instrument information and some basic setting alternatives.

- If required press **F5** (**NEXT**) until the **INFO** option is displayed on the menu line.

- Press **F3** to activate the **INFO** mode.

- Select the **INFO** item you want to change using the ▲, ▼,   and   keys.

- Adjust the selected item with the **/ /** and **/–/** keys.

13.1 Information and Settings in INFO Mode


```
INSTRUMENT S/N:        629
VERSION:               EU            2
SOFTWARE:              5.0.4B
MEMORY:                EXTENDED
BATTERY TYPE:          DRY CELL
BATTERY:               7.04Volt

BACKUP BATTERY:        2.58Volt

DATE & TIME:      WE 26 JAN 2000 16:52:21
PRINTER:               PROPRINTER
LCD DEFAULT:           CATALOG
REMOTE OPERATION:      NULL MODEM
INFO
SAVE                                  EXIT
```

Figure 13.a   *The INFO menu*

INSTRUMENT S/N:		Serial Number.
VERSION:	**EU**	EU **GRAPH** presentation (see chapter 8).
	DIN	Same as EU, but including geophone compensation in channels 1-4 according to DIN 45669 (see also chapter 12 for *activation* of this feature).
	SCAND	Same as DIN, but including geophone compensation in channels 1-4 according to SS 460 48 66 (see also chapter 12 for *activation* of this feature).
	US	US **GRAPH** presentation, including geophone compensation down to 2 Hz in channels 1-3.
SOFTWARE: E.YWW		Software version (**E**dition, **Y**ear, **W**eek).
MEMORY:		2048 kbyte.
BATTERY TYPE: (User selectable)	**DRY CELL**	
	LEAD ACID	The **CHRG** option is available (see section 3.6).
BATTERY:		See section 3.4 for further details.

BACKUP BATTERY: For memory and real time clock.

                                                Full at   >3.00V

                                                To be replaced at <2.50V

DATE & TIME: XX DD MMM YYYY HH:MM:SS
(User adjustable)

XX	=	Day of the week
DD	=	Date
MMM	=	Month
YYYY	=	Year
HH	=	Hour
MM	=	Minute
SS	=	Second

PRINTER: **DICONIX**   Type of printer. The printer must have an
(User selectable)   *RS-232 (serial) Interface*
              PROPRINTER   or be connected to the
                                                UVS 1500 with a
              EPSON   *6492 Serial/Parallel Cable.*

LCD DEFAULT: Default presentation on the LCD when activated from shut-
(User selectable)   down. Available options are **GRAPH**, **CATALOG**,
                                                TABLE, **BAR** and **Q-BAR**.

N B: **1.**   *New settings must be confirmed with* **F1** *(SAVE), otherwise the previous settings will remain.*

           2.   *The seconds in the DATE & TIME are reset by* **F1***, which can be utilized for accurate time setting.*

14 OUTPUT

The **OUTPUT** mode provides external communication via the inbuilt RS-232 interface. The 25-pin interface connector is located inside the battery compartment.
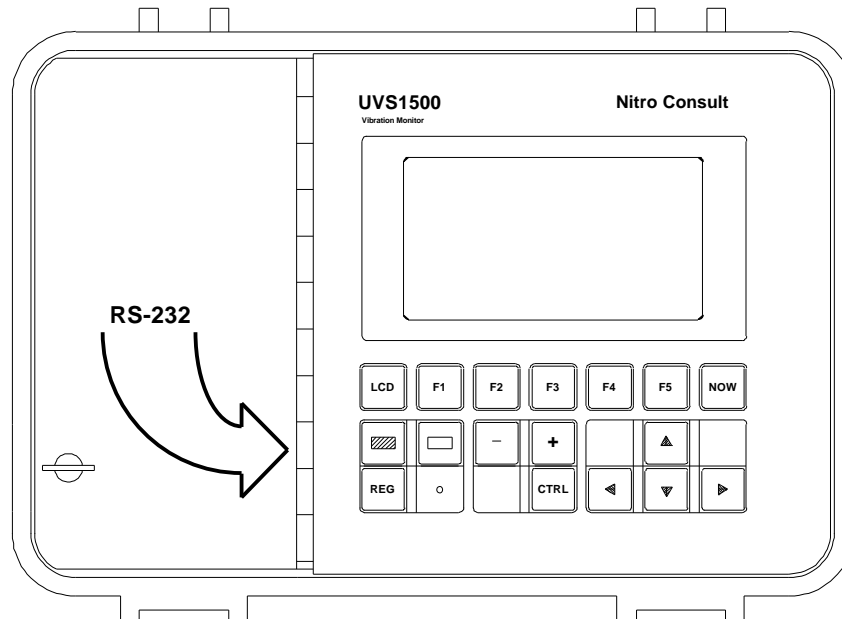
Figure 14.a

The three **OUTPUT** alternatives are **PRINTER** and **DISK**.

Figure 14.b   The OUTPUT menu

See sections 14.2 to 14.5 below for further details.

14.1 RS-232 Cables

The complete **UVS Modular Cable System** for the UVS 1500 consists of the following items:

1. A UVS 1500 plug.

2. A spiral cable with modular connectors.

3. ~~A 25-terminal PC plug~~. (Discontinued)

4. A serial printer plug to be used with a printer *with serial (RS-232) interface* emulating IBM Proprinter or Epson.

5. A 9-terminal PC plug.

6. A UVS 3601 Disk Drive plug.

7. A **Serial/Parallel Converter** (25/25 terminal) to be used with a printer *with parallel (Centronics) interface* emulating IBM Proprinter or Epson.

For each application a cable setup consisting of items **1** plus **2** and either of **4**, **5**, or **6** shall be used.

1, **2**, **5** and **6** are delivered with the UVS 1500 instrument, whereas **4** is optional.

7 is an optional item for the user who wants to utilize his existing parallel printer for direct printout from the UVS 1500. It has to be confirmed that the actual printer provides sufficient power (via the Centronics port) for the converter.
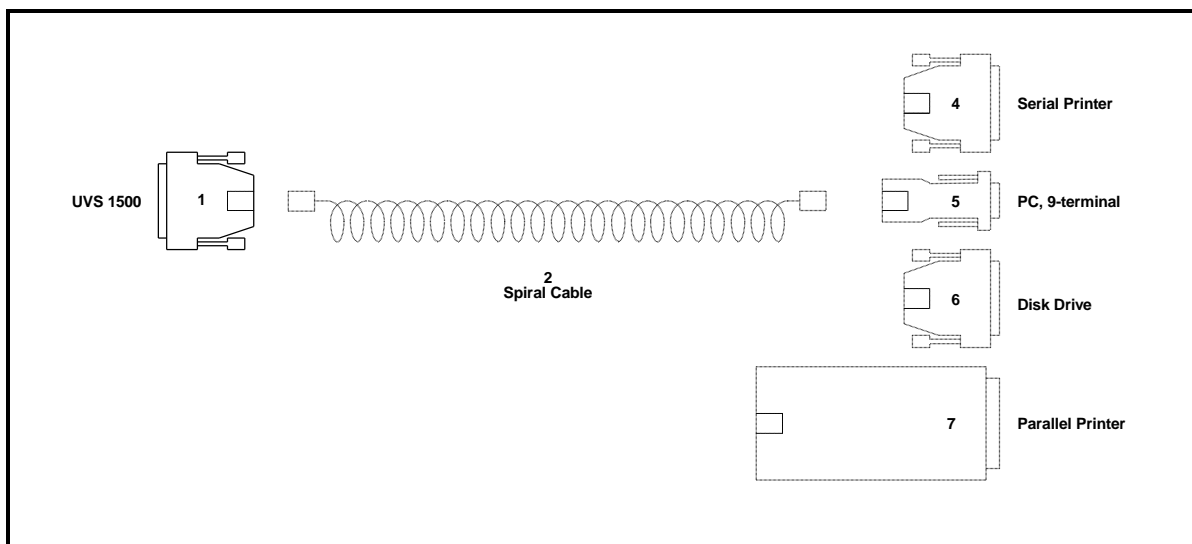
Figure 14.c

In addition to the modular cables there is a 25/25-terminal flat cable to be used (instead of **1**+**2**+**3**) when the UVS Disk Drive is to be powered by the UVS 1500.

Wiring diagrams for individual cables corresponding to the various combinations above are provided in Enclosure 9.

14.2 PRINTER Output

• Select the actual printer type in **INFO** mode.

• Setup the printer with the following parameters:

  - Line Feed   LF+CR
  - Protocol   RDY/BUSY
  - Parity   None
  - Data Length   8 bits
  - Baud Rate   9600
  - Stop Bits   1

• If required press **CTRL** + **REG** to switch into **REG OFF**.

• If required press **F5** (**NEXT**) until the **OUTPUT** option is displayed on the menu line.

• Press **F4** to activate the **OUTPUT** mode.

• The type of printout you will obtain depends on the presentation prior to your **OUTPUT** command (see Enclosures 11-14):

  - **GRAPH** prints the image of the selected event (as displayed on the LCD).

  - **TABLE** prints a table, with selected thresholds applied, from the selected day (**REG ON** or 00:00) until **REG OFF**.

  - **BAR** prints all 2-minute values of the selected day (00:00 to 24:00). UVS 1500 considers each recording period (**REG ON** to **REG OFF**) as a separate day.

  - **Q-BAR** prints all 2-second values of the selected half-hour.

• Press **F1** (**PRINTER**) to start printing .

• To interrupt printing in progress press **LCD**.

N B: *The **CATALOG** mode has its own **PRINT** command (see chapter 7).*

14.3 Screen Dump

• Press **CTRL** + **NOW** to make a printout (screen dump) of the current LCD presentation.

14.4 DISK Output

DISK copies UVS 1500 data to the **UVS 3601 Disk Drive** (optional), or directly to your PC using the **UVS Remote** software delivered with the instrument.

The UVSZ software delivered with the instrument can be used for time domain analysis of event files (zooming and time measurement).

The optional **UVS Peak** software is used for editing and printout of peak value data.

The optional **UVSZ Analysis** software is used for detailed analysis of event data (filtering, frequency analysis etc).

- Connect your Disk Drive or PC to the UVS 1500 using the relevant modular plugs (see section 14.1 above).

- Press **CTRL** + **REG** to switch into **REG OFF**.

- If required press **F5** (**NEXT**) until the **OUTPUT** option is displayed on the menu line.

- Press **F4** to activate the **OUTPUT** mode.

- Press **F3** (**DISK**).

- Press either of the following keys to start copying of data:

F1 = **TABLE & BAR**	All 2-minute peak values.	
F2 = **Q-BAR**	All 2-second peak values.	
F3 = **-**	Not installed	
F4 = **EVENT**	The Analysis Quality data (sample by sample) of the previous **GRAPH** presentation.	

- Copying is successfully copleted when the message **COPY OK** appears on the LCD.,

- To interrupt copying in progress press **LCD**.

Copying to the Disk Drive takes about 3 minutes for **TABLE & BAR**, 2 minutes for **Q-BAR** and 0.5 to 1.5 minutes (depending on recording length) for an Analysis Quality **EVENT**. Copying to PC via UVS Remote with null modem connection is 2-3 times faster.

14.5 Automatic Copying

Events will be copied automatically if a Disk Drive, or a PC with DISKSIM, is connected to the UVS 1500 in **REG ON**. Copying takes place directly after each registration in the UVS 1500 memory. In this way the Disk Drive or PC can be used as an alternative to, or a further extension of the UVS 1500 memory.

A permanently connected Disk Drive (or PC) will record until the disk is full. Thereafter the UVS 1500 will continue to register as usual.

15 Loading of Software

The internal software of the UVS 1500 is accommodated in a flash memory (EEPROM). Updated or special versions are installed from a **.**PRM diskette using the Disk Drive or a PC with DiskSim Win installed.

The following procedure applies:

- If required press **CTRL** + **REG** to switch into **REG OFF**.

- Press **LCD** to shut down the LCD.

- Hold down **F2** while pressing **LCD** to display the follwing menu:

```
                                              B345
            ****** UVS 1500 ******

     SOFTWARE LOAD

     F1   LOAD SOFTWARE FROM DISK OR PC
     F5   EXIT

     FILENAME: 15_XXXXX.PRM



  LOAD                                    EXIT
```
Figure 15.a   *The LOAD menu*

- Connect the Disk Drive or PC to the UVS 1500.

- Insert the **.**PRM diskette into the drive.

- Press **F1** to start loading the new software.

- Loading is completed when the message **SOFTWARE LOADED OK** appears.

- Press **F5** (**EXIT**).

- Check that the new software version is displayed in **INFO** mode.

Technical Specifications   Enclosure 1

Input

- 4 channels, separately programmable.   (US version preprogrammed for UVS triax. geophone + UVS mic.)

- Input impedance 200 kohm.

- Channel selectable input modes:

  - GEO; AC-coupled (0.001 Hz).   - " -

  - CCS; 1.5 mA constant current at 17V.   - " -

  - GEO DC.   - " -

  - OFF.

- Frequency ranges:

  - GEO: 0 to 80/315 Hz (-3 dB).   (US version Seismic 0 to 250 Hz)

  - CCS: 0.4 to 80/315 Hz (-3 dB).   (- " -   Air 0.4 to 250 Hz)

  - GEO DC: 0 to 80/315 Hz (-3 dB).   (Not included in US version)

- Low-pass filter roll-off 12 dB/oct.

- Circuitry for geophone response to 1 or 2 Hz (-3 dB) (DIN and US versions respectively).

- Maximum signal input +/-5.12V.

- Channel selectable sensor sensitivity: 0.500 to 599 mV/unit, with 3-digit resolution.

- Pre-installed units of measure:

- μm	- MPa
- mm	- psi/dB
- mm/s	- dBA
- ips	- N
- m/s2	- kN
- g	- mV
- Pa/dB	- V
- kPa	- EU ("Engineering Unit")

- Automatic sensor test at REG ON and every night at 02:00 hours.

Processing, Storage and Display

- Internal software in flash memory (EEPROM) for easy updating.

- AD-conversion with 14 bits dynamic range (autoranging), corresponding to
0.05-250 mm/s and 0.5-1500 Pa or 0.002-10 ips and 90-157 dB respectively.

- Full waveform GRAPH recording of 80 triggered events (max + min for each 1/500 division of the total recording sequence), including Peak, Integral, Differential and Resultant values as well as DIN or OSM/USBM criteria.

- Analysis Quality recording of 20-80 triggered events at sampling frequency accuracy
(up to 2000 Hz) for further processing and analysis on PC.

- Continuous peak monitoring in two parallel modes:

  a) Peak values with 2-minute resolution/32 days memory

  b)   - " -   2-seconds   - " -   /8 hours memory

  Both modes operate simultaneously and in parallel with the waveform recording.

  Display on LCD either as 4 parallel bargraphs or a 4-column table; the latter with threshold selection of displayed values whenever desired.

- Recording data:

Reg length	1	2	4	8	16	s
Whereof pre-trigger	0.1	0.2	0.5	0.5	0.5	s
Sampl freq	2000	2000	2000	1000	500	Hz
Time resolution, GRAPH	2	4	8	16	32	ms
" Analysis Quality	0.5	0.5	0.5	1.0	2.0	ms
Memory capacity, GRAPH	96	96	96	96	96	Events
" Analysis Quality	96	48	24	24	24	Events
File size, GRAPH	---	---	---	---	---	Bytes
" Analysis Quality	16,896	32,768	64,512	64,512	64,512	Bytes
" 32 days memory	-------------------		197,120	-------------------		Bytes
" 8 hours "	-------------------		131,584	-------------------		Bytes

- Max amplitude resolution: 1/5000 of the measurement RANGE (0.005 mm/s with UVS geophones).

- Trigger levels channelwise selectable with 2-digit resolution from 0.2 to 80 % of the total dynamic range.

- Presentation on illuminated LCD with 128 ∗ 256 pixels.

- Catalog mode provides overview presentation of all events stored in the memory.

Output and Documentation

- RS-232 interface for

    - Printout on separate printer (various types supported)

    - Memory download to 3.5" disk (via optional Disk Drive), or to PC (using the UVS Remote software provided with the instrument).

    - Loading of new software into the internal flash memory (using.the DiskSim Win software provided with the instrument).

Real Time Clock

- Time deviation: Less than 1 minute per month (25 ppm) within ±0 to +50 $^{\text{O}}$C.

    Less than 3 minutes per month (75 ppm) within -20 to +60 $^{\text{O}}$C.

Temperature Range

- For measurement and recording: -20 to +60 $^{\text{O}}$C.

- For LCD reading and RS-232 output: ±0 to +60 $^{\text{O}}$C.

Power Supply

- 6 ea dry batteries IEC LR20, (1.5V, 18 Ah), or 1 ea rechargeable battery (6V, 10 Ah).

- Additional mains connection via adaptor.

- Power consumption:

    - In REG OFF mode: <1 mA.

    - In scanning mode: <20 mA.

    - With LCD on: <250 mA.

    - With INPUT in CCS (SETUP mode) and airblast microphone, accelerometer or signal integrator connected (EU, DIN & SCAND versions):   <4 mA additionally per channel.

    - With INPUT in GEO, COMPENSATION in HUMAN (SETUP mode) and HD geophone connected (DIN & SCAND version only):   <5 mA additionally per channel.

    - With air channel in dBA (SETUP mode) and airblast microphone connected (US version only):   <9 mA additionally.

- Battery voltage "on request"; automatic Low Battery warning.

- Internal lithium-type battery (life approx. 10 years) for back-up of memory and real time clock.

Dimensions

- 380 x 270 x 155 mm.

Weight

- 6.6 kg with dry batteries and standard sensors, 7.5 kg with rechargeable battery and standard sensors (cables excluded).

SPECIFICATIONS ARE SUBJECT TO REVISION WITHOUT NOTICE.

UVS Geophones Std
(4 Hz)

20 4010 00, vertical (grey)
20 4011 00, horizontal (red)
20 4012 00, inverted vertical (amber)
20 4015 00, triaxial
20 4016 00, triaxial/wall

- Electrodynamic velocity transducer with resonant frequency compensation.

- Sensitivity (output) 20 mV/mm/s, ±15% (DIN 45669)

- Frequency range 4-1000 Hz (-3 dB at 4 Hz)
(With low pass filtering in the
UVS 1500: 4-80/315 Hz)

- Resonant frequency 4.5 Hz, ±0.5 Hz (undamped)

- Dynamic range a) 50 mm/s at 4 Hz

  b) 12500 mm/s at 1000 Hz

  c) linear inbetween

- Connector type TNC (20 4010 00 - 20 4012 00)
AMP (20 4015 00)

- Dimensions $\varnothing$35 x 76 mm (20 4010 00 – 20 4012 00)
70 x 70 x 47 mm (20 4015 00)

- Weight 165 g (20 4010 00 – 20 4012 00)
725 g (20 4015 00)

UVS Geophones HD
(For 1 Hz compensation)

20 **4120 00**, vertical (grey)
20 **4121 00**, horizontal (red)
20 **4122 00**, inverted vertical (amber)
20 **4125 00**, triaxial
20 4126 00, triaxial/wall

- Electrodynamic velocity transducer with resonant frequency compensation. Selected to match 1 Hz-compensation electronics in the UVS 1500.

- Sensitivity (output)   20 mV/mm/s, ±15% (DIN 45669)

- Frequency range (uncompensated)   4-1000 Hz (-3 dB at 4 Hz)
                                         (With inbuilt compensation and low pass
                                         filtering in the UVS 1500: 1-80/315 Hz)

- Resonant frequency   4.5 Hz, ±0.5 Hz (undamped)

- Dynamic range   a)   50 mm/s up to 4 Hz

                                         b) 12500 mm/s at 1000 Hz

                                         c) linear inbetween

- Connector type   TNC   (20 4020 00 – 20 4022 00)
                                         AMP   (20 4025 00)

- Dimensions $\varnothing$35 x 76 mm   (20 4020 00 – 20 4022 00)
                                         70 x 70 x 47 mm   (20 4025 00)

- Weight   165g   (20 4020 00 – 20 4022 00)
                                         725g   (20 4025 00)

UVS Airblast Microphone 20 4313 00

-         Polarized electret microphone.

-         Sensitivity   2 mV/Pa

-         Frequency range   2-8000 Hz (-3 dB)

-         Dynamic range, input   1500 Pa; 158 dB linear relative 20 µPa)

-         "   " , output   ±3V

-         Output bias   4-6 V at 2 mA

-         Output impedance   600 ohm

-         Power supply   Constant current 0.4-2.5 mA at 15-30V
                                                   (CCS feature in UVS 1500)

-         Mounting thread   1/4" UNC (camera standard)

-         Connector type   TNC

-         Dimensions $\varnothing$15 x 125 mm

-         Weight   90 g

- - - - -

The correlation between decibel (dB) and pascal (Pa) is as follows:

$$dB = 20 \times {}^{10}\log[Pa/(2 \times 10^{-5})]$$

Example: Pa = 1500

$$dB = 20 \times {}^{10}\log[1500/(2 \times 10^{-5})] = 20 \times [{}^{10}\log75 + 6] =$$

$$= 20 \times (1.875 + 6) = 158$$

UVS Accelerometer Std 20 4520 00
(0.5 Hz)

-     Piezoelectric acceleration transducer with inbuilt impedance conversion.

-     Sensitivity   20 mV/m/s2 (approx. 200 mV/g) at 160 Hz

-     Frequency range   0.5-3000 Hz (-3 dB)

-     Resonant frequency   Approx. 8 kHz

-     Dynamic range, input   ±150 m/s2

-         "   " , output   ±3V

-     Output bias   4-6V at 2 mA

-     Transverse sensitivity   <5 %

-     Power supply   Constant current 0.4-2.5 mA at 15-30V
    (CCS feature in UVS 1500)

-     Connector type   TNC

-     Dimensions   ∅35 x 64 mm

-     Weight   235 g

UVS Accelerometer HS 20 4530 00
(0.1 Hz)

- Piezoelectric acceleration transducer with inbuilt impedance conversion.

- Sensitivity   200 mV/m/s2 (approx. 2000 mV/g) at 160 Hz

- Frequency range   0.1-150 Hz (-3 dB)

- Resonant frequency   Approx. 8 kHz

- Dynamic range, input $\pm$10 m/s2

-    "   " , output $\pm$2V

- Output bias   4-6V at 2 mA

- Transverse sensitivity   <5 %

- Power supply   Constant current 0.4-2.5 mA at 15-30V
(CCS feature in UVS 1500)

- Connector type   TNC

- Dimensions $\varnothing$35 x 69 mm

- Weight   235 g

UVS Signal Integrator 20 3510 00

-	Analog signal integrator.	
-	Sensitivity (output)	2 mV/µm and 20 mV/mm/s with UVS Geophones 4010-4012 or 4020-4022
-	Frequency range	1-1000 Hz (±3 dB)
-	Power supply	Constant current 1.5-2.5 mA at 15-30V (CCS feature in UVS 1500)
-	Connector type	TNC
-	Dimensions	125 x 80 x 60 mm (excl. connectors)
-	Weight	550 g

Battery Capacity

A rough assessment of remaining battery capacity can be made by reading the battery voltage in the SETUP menu at normal load, i e when the LCD of the UVS 1500 has been activated for at least 1 minute.

Battery voltage V	Remaining capacity % (At 20 degrees Celsius)
9.60	100
7.50	75
7.05	50
6.60	25
5.85	10

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

1. UVS 1500 - Disk Drive 3601

A 25/25-terminal flat (ribbon) cable is recommended, especially if all functions as below shall be included.

UVS 1500:   **Disk Drive:**

25-terminal D-sub   25-terminal D-sub
sockets   pins

2 txd---------------------------rxd 2   (mandatory)
3 rxd---------------------------txd 3   - " -
5 cts --------------------------rts 5   - " -
7 gnd ------------------------ gnd 7   - " -

21 dtr-----------------------rsstart 21   (for automatic EVENT copying
                                                                         to disk when the Disk Drive
                                                                         is permanently connected)

14 gnd ----------------------- gnd 14   (for power supply from
15 gnd ----------------------- gnd 15   the UVS 1500)
16 gnd ----------------------- gnd 16   - " -
23 +bat--------------------- rspwr 23   - " -
24 +bat--------------------- rspwr 24   - " -
25 +bat--------------------- rspwr 25   - " -

2. UVS 1500 - Printer

UVS 1500:   **Serial** printer emulating
                                                                        IBM Proprinter or Epson:

25-terminal D-sub   25-terminal D-sub
sockets   pins

2 txd--------------------------rxd 3
3 rxd--------------------------txd 2
5 cts --------------------------dtr 20
7 gnd ------------------------ gnd 7

3. UVS 1500 - PC

UVS 1500:   **PC:**

25-teminal D-sub   9-terminal D-sub
sockets   sockets

2 txd---------------------------rxd 2
3 rxd---------------------------txd 3
4 rts-⌐---------------------- ⌐-dcd 1   (to be strapped <u>within</u>

5 cts-⌐ ---------------------- ⌐-dtr 4   respective connector)
---------------------------- ⌐-dsr 6   - " -
---------------------------- ⌐-cts 8   - " -
7 gnd ------------------------ gnd 5
21 dtr----------------------------ri 9

ABEM

GRAPH Printout

--- ooo ---

```
INSTRUMENT S/N      338
EVENT #             006
DATE & TIME         TH 18 AUG 1994 10:52:43

              1       2       3       4
UNIT         mm/s    mm/s    mm/s    Pa
TRIG LEVEL      5.      5.      5.      OFF
REG LENGTH   1 s

PEAK         19.7    1.6     3.6     1.
DIFF         11.7    1.3     0.8     0.
INTEG        44.5    16.     77.3    11.7
FRQ(zx) Hz   98.     76.     11.     4.5

VECTOR MAX (CH 1-3)  19.7 at  0.001s


TIME  SCALE     0.1  s/div
GRAPH SCALE
      20.mm/s    2.5mm/s    5.mm/s    12.5Pa
         1           2          3          4
```
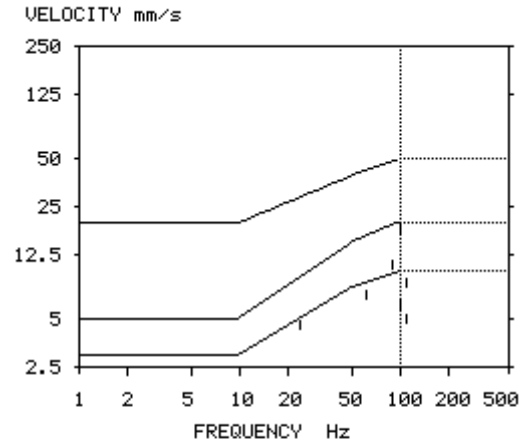
PPV/ZX PLOT (DIN 4150)

VELOCITY mm/s

SENSOR TEST
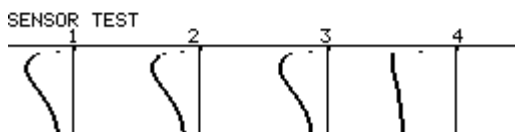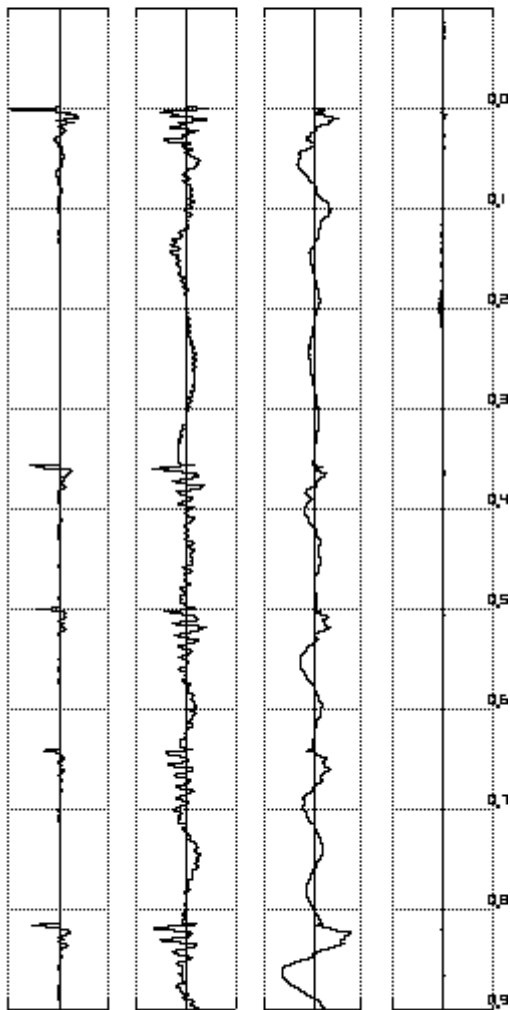
TABLE Printout

```
UVS 1500            TABLE
INSTRUMENT S/N            405

CLIENT:

OPERATION:

LOCATION:


OPERATOR:

NOTES:


-----------------------------------------------
                    1         2         3         4
UNIT              mm/s      mm/s      mm/s      mm/s
THRESHOLD          6.        6.        6.        2.
-----------------------------------------------
DATE     TIME
-----------------------------------------------

FR 02SEP 18:41      START ----------------------
FR 02SEP 18:45      21.5      13.8      18.25     0.14
FR 02SEP 20:53      73.5      41.       47.       0.19
FR 02SEP 20:59       6.55      3.1       5.1      0.11
SA 03SEP 06:45      21.25      9.65     21.25     0.08
SA 03SEP 12:59      11.15      7.6      11.4      0.26
SA 03SEP 13:13       8.        4.        3.9      0.11
SA 03SEP 13:19      10.8       6.05      7.15     0.19
SA 03SEP 13:21       6.45      5.4       8.65     0.1
SA 03SEP 20:23      32.5       9.9      12.45     1.61
SA 03SEP 21:05      71.       19.85     29.       2.5
SU 04SEP 00:43      26.5      91.       34.5      0.09
SU 04SEP 01:03      16.3      13.85     11.75     0.07
SU 04SEP 09:09      55.       21.3      28.       1.16
SU 04SEP 16:33       7.3       5.65      3.35     0.16
SU 04SEP 21:05      13.65      6.35     14.55     0.22
SU 04SEP 21:07      26.       12.25      7.5      0.26
SU 04SEP 21:21       5.9       5.15      8.1      0.47
SU 04SEP 21:23       6.8       4.05      3.15     0.35
MO 05SEP 06:53      STOP ----------------------
```
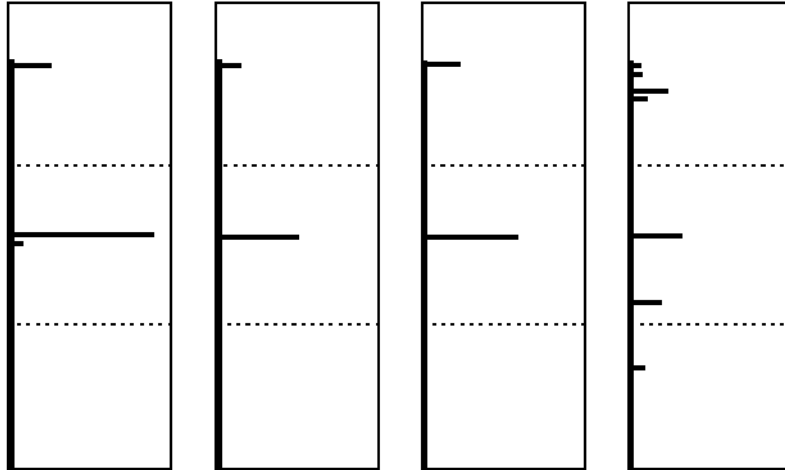
```
UVS 1500     BAR
INSTRUMENT S/N          405
       1              2              3              4
TIME SCALE: 2 hours/div
GRAPH SCALE:
   80.mm/s       80.mm/s       80.mm/s        2.mm/s
FR 02 SEP 1994 18:00:00
```
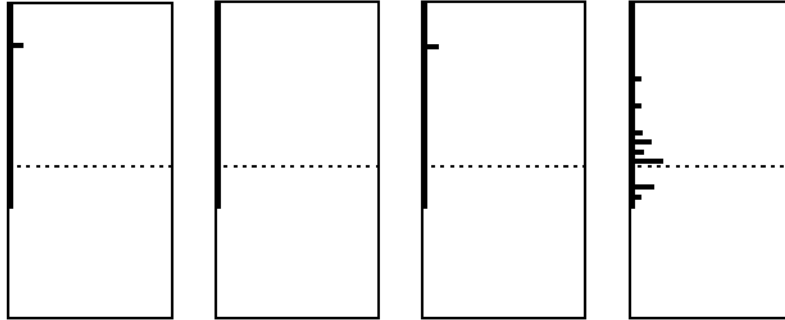


```
                                                        FR 02 SEP
1994 24:00:00
MAX:
   73.5mm/s       41.mm/s       47.mm/s       .63mm/s
```

```
UVS 1500     Q-BAR
INSTRUMENT S/N          405
      1             2             3             4
TIME SCALE: 2 min/div
GRAPH SCALE:
   80.mm/s      80.mm/s      80.mm/s      2.mm/s
MO 05 SEP 1994 07:00:00
```



```
MO 05 SEP 1994 07:04:00
MAX:
   10.8mm/s     0.05mm/s     12.8mm/s     .46mm/s
```