ABEM Instrument AB

TERRALOC MK6 SYSTEM

Reference Manual

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TRADEMARKS

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Chapter 1

1 GET TO KNOW YOUR TERRALOC® MARK 6

1.1 WELCOME TO REFRACTION, REFLECTION, TOMOGRAPHY

Welcome to the ABEM TERRALOC®[1] MK6, the multi-channel digital seismograph for cost-effective refraction and high-resolution reflection surveys, tomography, vibration measurements, and more. For work anywhere in the world in all weather conditions.

The basic TERRALOC MK6 is a self contained multi-channel seismograph with internal PC-compatible computer (386/486 CPU), an 80-250 MB hard disk, a 3 1/2 in. storage disk, and a standard VGA graphic display. TERRALOC MK6 PLUS is similar but has also a SCSI interface. Operating power comes from any external battery pack or power source that delivers from 10 - 30 volts DC. Typically this means a re-chargeable NiCd battery pack, a car (or truck) battery, or AC/DC power pack.

TERRALOC connects, as standard, to a printer, serial mouse,an external keyboard and CRT monitor. In the PLUS version, it also may be connected to external data storage media such as a streamer, WORM devices, Bernoulli drives, DAT drives, external hard disk, or almost anything that can be connected to the SCSI interface.

With more than 24 channels installed, TERRALOC MK6 comes in a slightly bigger and heavier box.
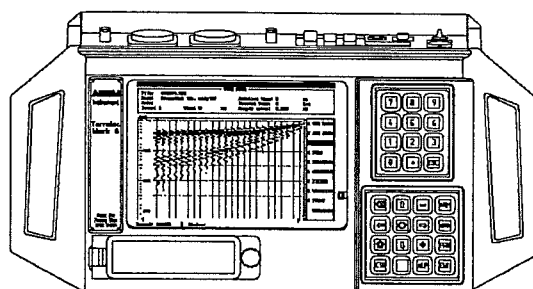
Figure 1.1   *TERRALOC MK6.*

After a survey you may process data stored on the internal hard disk or on a floppy disk either using TERRALOCs internal PC or an external computer. Filtering and basic processing uses the TERRALOCs internal software. Many third party software packages for seismic data processing can be run directly on the TERRALOC. Please ask your authorised ABEM Distributor for details about seismic interpretation and processing packages that are available.

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[1] *Terraloc is a Registered Trademark of ABEM Instrument AB.*

Your TERRALOC was carefully checked at all stages of production. It was thoroughly tested before being approved for delivery. If you handle and maintain it according to the instructions in the technical documentation, you will get many years of satisfactory service from it.

1.2 POWERFUL NEW FEATURES

Among the new powerful features you'll find in ABEM TERRALOC MK 6 are:

- Excellent resolution thanks to an 18 bit ADC (analog/digital converter) and 3 bit IFP (instantaneous floating point) amplifier

- Quicker set-up times thanks to a dynamic range of 126 dB meaning no worries with gain settings

- Fully compatible with your office computer thanks to use of Microsoft MS-DOS v 6.0, an internal hard disk, an internal 1.44 MB 3 1/2 in. disk drive, and use of SEG-2 standard data file format

- Usable with various energy sources even the new mini-vibrators thanks to record length settings, from 128 to 16384 samples in eight steps, as well as the possibility to assign one channel (12 or 24) as a source signature recording channel

- In-field quality control of measurements thanks to geophone tests, noise monitoring, and a wide choice of single- or multi-trace view modes

- Full control and selection of all operating functions from two top panel keyboards with 28 keys. When in the office connect in a 102-key PC-AT keyboard and serial mouse for convenience

- Excellent results for tomography and high resolution seismics thanks to selectable sampling rates from 25 μs to 2 ms in seven steps

- Full on-screen display of recorded traces with software roll-along, automatic pick of first arrivals, list of first arrival times, velocity calculation, frequency analysis of single traces.

- Low weight, only 16 kg, small volume, only 0.03 m³, all in a robust waterproof casing

1.3 REGISTER YOUR WARRANTY AND SOFTWARE

Fill in and mail your Warranty Card without delay. When you are registered with ABEM, you'll get information about product updates, operating and service tips, special offers, etc. So take a minute now, fill in the card, and mail it. Your TERRALOC is covered by the ABEM Worldwide Warranty. This means the equipment is free from defects due to material or faulty workmanship. The warranty covers servicing and adjusting of any defective parts excluding fuses, and batteries provided the TERRALOC is returned, freight and insurance paid, to ABEM. If ABEM finds that the cause of fault or defect is due to misuse or abnormal operating conditions, then repairs will be invoiced at cost. ABEM assumes no responsibility for steps that are either taken or not taken as the result of decisions based on the results of measurements taken with TERRALOC or calculations based on software delivered by ABEM. The warranty is valid for twelve (12) months from date of Bill of Lading or other delivery document issued to the original purchaser. ABEM liability under this warranty is limited in accordance

with terms of Clause 9, the General Conditions for the Supply of Plant and Machinery for export, prepared under the auspices of the United Nations Economic Commission for Europe, Geneva, December 1953

1.4 DID TERRALOC ARRIVE COMPLETE AND UNDAMAGED?

Your TERRALOC arrives in a wooden transport box. Open it and unpack all items carefully. Check contents against the packing list. Check box for transport or handling damage.

A standard ABEM TERRALOC MK 6 basic system includes the following

1	TERRALOC field unit with a number of channels as shown on the packing list
1	Accessories and tools kit comprising

1	Tool bag
10	3.5 in. disks, high density (1.44 MB)
10	fuses 2.4 Amp "slow"
1	Cable for external battery, with connector and crocodile clips
2	Cables for office power supply- mains cable with appropriate plug, interconnect cable with car lighter socket adapter
2	2 m connection cables (for trigger coil)
1	Insulating tape roll
1	Engineer pliers
1	Pair of cutting nippers
1	Hex wrench 4 mm
1	Hex wrench 5 mm
1	Screwdriver 2.5 mm x 50 mm
1	Phillips screwdriver
1	Trigger coil
1	Office power supply, 115 V or 230 V. Be sure to specify voltage when ordering.

1   Documentation kit, comprising

2	TERRALOC MK 6 Reference manuals
1	Computer technical reference manual (included in one of the TERRALOC MK6 Reference manuals)
1	DOS Manual
1	SEG-2 format description
1	TERRALOC MK6 software disk
1	Disk with sample records
1	Warranty registration card

250 m Trigger cable on reel

Check that you have received all items shown on the packing list; check also that they are externally undamaged. If you ordered optional equipment, check the packing list for details and compare with your original order.

File any claim for shipping damage with the carrier immediately on discovery and before using the TERRALOC. Send a copy of your claim or damage report to ABEM or to your authorised ABEM

Distributor. If it is a question of short shipment you must make a claim in writing to ABEM within 14 days of your receipt of shipment. Please state the original ABEM Invoice Number and the TERRALOC serial number in all correspondence with ABEM or your authorised ABEM Distributor.

You should keep and store all original packing material for later use, for example, to send the TERRALOC for service. If you do not have access to original packing material, then pack your TERRALOC in a robust wooden box large enough to allow 80 mm of shock absorbing material to be placed all around the equipment top, bottom, and all sides. Never use shredded fibre, paper or wood wool these materials pack down in transport and the equipment may move around inside the box. If you have to return your TERRALOC to ABEM or its authorised distributor, please ask for shipping instructions before despatch.

1.5 TAKE TIME TO READ THE TECHNICAL DOCUMENTATION

To ensure you get optimum results with ABEM TERRALOC MK 6, please take time to read this Reference Manual thoroughly. It gives you detailed step-by-step instructions for cost-effective field measurements. You should also look through this Reference Manual to become familiar with its layout and contents. If you should, for any reason, have difficulties in operating ABEM TERRALOC MK 6 or in getting satisfactory seismic survey results, please contact your authorised ABEM distributor. ABEM always listens to end-user comments about their experience with ABEM products. So please send occasional reports on field usage as well as your ideas on how the TERRALOC and its technical documentation could be improved to help you do an even better job of seismic surveying.

1.6 CONVENTIONS USED IN THE REFERENCE MANUAL

- TERRALOC keys to press are shown in bold text within brackets: **<ENT>**, **<CTR>+<ESC>**

- The second example above indicates that you should press the **<CTR>** and **<ESC>** simultaneously.

- Commands (buttons) are shown in normal text within brackets: <Ok>, <Cancel>, <Copy>, etc.

- When there are multiple choices, these are shown in italics:
  Autostack
  Fast stack
  Preview
  Stack once

- TERRALOC prompt texts are shown within brackets []:

  [Press <SPACE> to toggle]
  [Press <SPACE> to list]
  [Clipping in number of traces (1-24), 0=No clipping]

- Messages and queries are indented relative to the paragraph margin.

- While any pointing device compatible with the Microsoft Mouse Driver can be used with the MK6 program, it will be referred to as the mouse in this manual.

- Unless otherwise stated, it is assumed that the TERRALOC MK6 is equipped with 24 channels and they are all active.

1.7 SOFTWARE INSTALLATION GUIDE

The TERRALOC MK6 is delivered with one software disk and one disk with sample records. Each disk installs the contents automatically. The MK6 software as well as the sample files are installed on delivery. If needed (e.g. a system file was accidentally accidentally deleted) or when recieving an software update, you may reinstall the software according to the following instructions.

Automatic installation

1) If you have made any changes to the CONFIG.SYS or AUTOEXEC.BAT files, you should make a backup copy of these files to a floppy disk. (You can use the Filemanager in the Mk6 program.)

2) Insert the software update disk.

3) Switch on TERRALOC MK6.

4) The program installs itself automatically.

5) When TERRALOC MK6 displays a message that installation is ready, <u>remove the install disk and switch off</u> TERRALOC MK6.

6) The next time you start TERRALOC MK6, it will run the updated program.

7) The first time the program is started, a system definition menu (see section 3.4) is displayed. Check that the values in this menu are correct and edit any incorrect parameters. Press <ESC> to exit and perform a system calibration. If you need to access this menu later, connect an external keyboard and press <F12>.

IMPORTANT! During the installation, the files config.sys and autoexec.bat are replaced by corresponding files on the installation disk. However, they are backed up before being replaced, so if you have made any changes to these files, you should restore the backed up files.

The backed up files new names are: _config.bak and _autoexec.bak

Manual installation

The manual installation requires an external keyboard to be connected.

1) Delete the files: - C:\MK6\SYS\MK6.STS
- C:\MK6\SYS\SESSION.COL
- C:\MK6\SYS\SESSION.MK6
- C:\MK6\SYS\SYSTEM.DEF

2) Type XCOPY A:\MK6 C:\MK6 /S and press ENTER.

3) Type A: and press ENTER.

4) Type INSTALL SERIAL.INS and press ENTER to copy the Terraloc's serial number to the installed program.

No separate software is necessary for TERRALOC MK6 48-channel seismograph. The software configures itself according to the input in the System Definition Menu when first started after installation.

1.8 SCSI INSTALLATION GUIDE

If your TERRALOC MK6 has an optional SCSI interface you will find a diskette and installation manual from Adaptec enclosed to the documentation kit. The contents of the diskette have been copied to the C:\SCSI directory of the hard disk on your instrument. In the same directory you will also find a sample CONFIG.SYS file containing installation commands for an external SCSI disk drive. If you wish to install an external SCSI disk, just copy the sample CONFIG.SYS from C:\SCSI to the root directory, C:\. For installation of other SCSI devices, follow the instructions provided by the manufacturer and Adaptec.

Please note that "ADAPTEC SOFTWARE" brochure is written for ADAPTEC's AHA-1510 boards not for MK-6 seismographs. Nevertheless, one may use the ADAPTEC software with MK-6 SCSI interface, as they are 100% compatible. The only difference is that MK-6 can use only two interrupts: IQ12 (default) or IQ10 (optional). The other two interrupts available on the ADAPTEC's boards are occupied.

A proper installation command in the CONFIG.SYS file should look:

    DEVICE = C:\SCSI\ASPI2DOS.SYS /Z /Q12

If you wish to use interrupt 10 instead of 12 please change the proper jumper on the controller board of the MK-6 and use /Q10 parameter instead of Q12 in the installation command.

You may also change SCSI port address from 340H (default) to 140H but you must close JMP3 port address jumper on the MK6 controller board and add one more parameter to the installation command, i.e. /P140.

Please read a sample CONFIG.SYS file on \SCSI\ directory.

Note that besides the ASPI2DOS driver installation it contains another command: "ASPIDISK.SYS". It is a command for SCSI hard disks installation. Use proper drivers for other SCSI devices.

1.9 TECHNICAL SPECIFICATION

Up-hole channel	Channel 12 or 24, redirectable to a separate connector. (In a 48-channel box, channels 24 and 48 are redirectable).
Sampling rates	25, 50, 100, 250, 500 µs, 1, 2 ms.
Record length	Selectable from 3.2 ms to 32.7 s equivalent to 128, 256, 512, 1024, 2048, 4096, 8192 or 16384 samples.
Maximum number of stacks	999
Pre-trig recording	Selectable, 0-100 % of record length.
Delay time	Max delay time is related to the sampling interval. For example selectable, from 0-0.8 s at 25 µs sampling interval to 0-131 s at 2 ms sampling interval.
First arrivals picking	Automatic or manual. Picked first arrivals can be saved to disk.
Trigger inputs	Make/break (=switcher), Analog or TTL.
A/D converter resolution	18 bits + 3 bit IFP (= 21 bits)
Dynamic range	126 dB (theoretical)
Minimum input signal	± 0.24 µV
Maximum input signal	± 250 mV
Frequency range	2 - 4000 Hz
High pass (low-cut) filter	Selectable, 12 dB/octave 12-192 Hz in 16 steps or 24 dB/octave 15-240 Hz in 16 steps.
Notch filter	50 or 60 Hz. Specify when ordering for factory installation and calibration.
Anti-aliasing	Automatically set according to sampling frequency.
Processor	386/486 (depending on model)
Memory	4 to 32 MB RAM (depending on model)
Data storage	80 to 250 MB hard disk and 1.44 MB floppy disk drive 3.5 in. (depending on model)
Display	9 in. LCD, daylight visible, backlighted, VGA resolution (640x480 pixels).
Digital I/O	Parallel (Centronics), serial (RS-232) and external monitor (CRT). SCSI interface is optional (depending on model).

Power	10-30 V DC external battery or office power supply.
Maximum power consumption	15 W (sleep mode), 40 W (operating mode).
Operating temperature	5°C to 50°C. If unit is at normal room temperature (from being kept indoors) when switched on, it generates enough internal heat for field work at temperatures down to -5°C.
Storage temperature	- 40°C to +80°C.
Casing	Waterproof, rugged cast aluminium.
Dimensions	400 x 250 x 300 mm (24-channel box).
Weight	16 kg (24-channel box).

Chapter 2

2 THE FIELD UNIT AND PROGRAM CONVENTIONS

2.1 EXTERNAL CONNECTIONS

You make all external connections - receivers (geophones), power, etc - at the rear panel, see figure 2.1. **When your TERRALOC is not in use, always have the connector protection covers in place.**
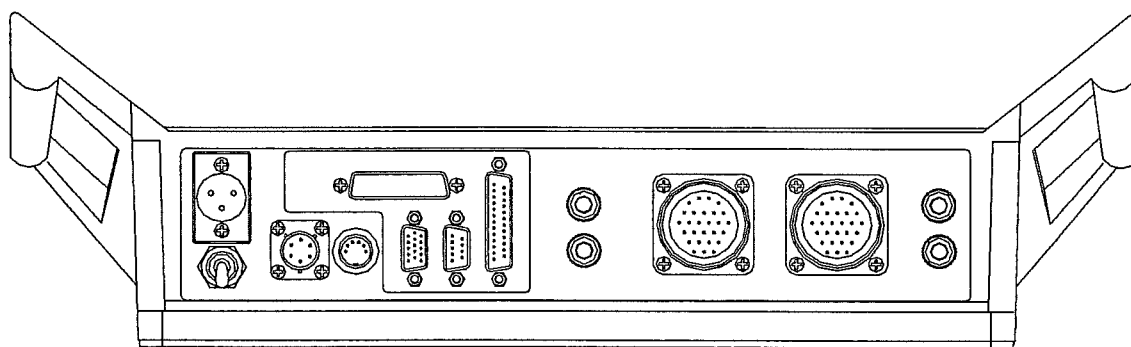
Figure 2.1   *TERRALOC MK6 rear panel.*

- Power Connector, for any 10-30 V DC source. Mating connector: Cannon AXR-3-11C. When power is "on", a red LED at lower right side of the screen is active. Even if the power switch is "off" when you connect a "live" power cable, this LED blinks once.

- TTL Trig/Arm connector, to connect two or more TERRALOCs as Master and Slave(s), for radio shot, and vibrator hand-shaking. Mating connector: Cannon KPT 06F 10-S

- Connector for external AT-compatible keyboard.

- SCSI connector for external devices - MK6 PLUS only. Mating connector: Amphenol 57 series - pin connector 57F-30500 and cover 57F-50H

- CRT connector for external monitor. Mating connector: Cannon DE-15S

- RS232 serial connector for mouse, track-ball, serial devices or communication with external computer. Mating connector: Cannon DE-9S

- Centronics connector for parallel data communication, e.g. output to a printer with parallel interface. Mating connector: Cannon DB-25P

- Trigger input connector for a trigger geophone, shot instant contacts, a wire loop around the explosive charge, or trigger output from a mechanical energy source. Mating connectors: 4 mm banana plug or bare wire.

- Signal connectors for geophone spread cables. Two 12-channel connectors wired to industry standard with channel #1 on pins 1-2, channel #2 on pins 3-4, and so on. Mating connector: Cannon NK-27-21 C-12in.

- Reference channel connector for a single geophone or vibrator reference (signature). A signal from the reference channel may be redirected (software selectable) to either channel 12 or channel 24. Mating connectors: 4 mm banana plug or bare wire.

2.2 TWENTY-EIGHT KEYS GIVE YOU FULL CONTROL

You operate ABEM TERRALOC MK6 with 28 keys conveniently placed in two keypads - numerical (upper) and command (lower) - on the right of the display screen (Figure 2.2).

The numerical keypad has numbers <0>-<9>, decimal point (<.>), and <ESC> (escape).

<ESC> cancels commands, exits menus, breaks print outs and disarms the instrument.

<CTR> + <ESC> always takes you to the system setup menu, except in armed mode, and in the automatic receiver spread menu.

Below follows a list of the command keys and their functions. Please note that some key functions differ in some menus. When a key has a special function in a menu, it will be explained at the entry for that specific menu.

Definition of command keys

<BACKSPACE>	deletes the character left of the cursor when moving backwards.
<SHIFT> + <BACKSPACE>	deletes the character under the cursor and pulls the text from the right.
<CTR> + <BACKSPACE>	resets the value in numerical fields to 0 (zero) and unmarks all previously marked items in a list.

<ARROWS>	
<LEFT>|<RIGHT>	arrows move the text cursor backward or forward over characters inside a text field, select current trace.
<SHIFT>+{<LEFT>|<RIGHT>}	works like Home and End.
<UP>|<DOWN>	select items in a menu list, scroll traces.
<SHIFT> + {<UP>|<DOWN>}	works like page up and page down.
<CTR> + {<ARROWS>}	arrows accelerate movement of the arrows.

<+>|<->	in addition to their normal function as characters, they move the time marker line when you are in the VIEW DATA screen. Adjust the LCD contrast in the main menu.
<SHIFT> + {<+>|<->}	adjusts the contrast level of the LCD screen.
<CTR> + {<+>|<->}	accelerates time marker movement speed.

<ARM>	makes TERRALOC ready for a measurement, i.e. for receiving a trigger signal.
<CTR> + <ARM>	gives an internal software trigger (simulates a real trigging signal).

<TAB>	moves the cursor from current menu field to the next field.
<SHIFT> + <TAB>	moves the marker from current menu field to the previous field

<CTR> + <TAB>	opens automatic management menus in Receiver Spread and Receiver layout menus.
<SAVE>	copies data in memory to either hard or floppy disk and updates record.
<SHIFT>	modifies the function of some keys. For example **<SHIFT> + <+>** and **<SHIFT> + <->** adjust the screen contrast. **<SHIFT> + <PRN>** accesses the print options menu window direct from any menu.
<PRN>	Prints current record in View Data. If a trace has been zoomed, this trace is printed.
<SHIFT> + <PRN>	Opens the printer setup menu. Can be used in any menu.
<CTR>	(control) modifies the function of some keys. For example **CTR>+<ARM>** simulates trigger signal.
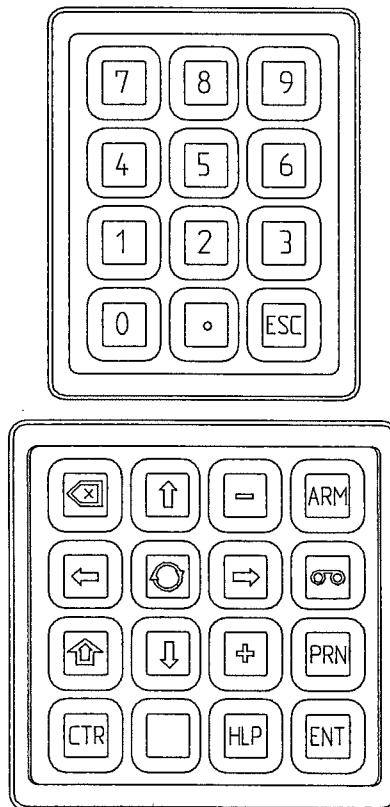
Figure 2.2   *TERRALOC MK6 keyboards.*

<SPACE>	the unmarked key equivalent to the spacebar on a full keyboard - inserts a space when typing text in menu fields. It also opens pop-up lists in window dialogue boxes and toggles choices.

\<SHIFT\> + \<SPACE\>	Toggles between insertion and typeover mode in text fields.
\<HLP\>	brings up the on-line help screens.
\<SHIFT\> + \<HLP\>	opens a menu containing some topics of interest, such as: File Formats, Error Messages etc.
\<CTR\> + \<HLP\>	gives you access to the text of the Terraloc Mk6 on-line manual.
\<ENT\>	(Enter) executes commands, selects in multiple choice lists, and marks items in lists. Sometimes known as CR or RETURN key.
\<CTR\> + \<ENT\>	Marks all items in lists.

2.3 EXTERNAL PC-AT KEYBOARD

You may connect a standard PC-AT keyboard via the back panel, for controlling and operating your TERRALOC. For key functions equivalents see table Table 2.1 (page 2-11).

The keyboard connected should be a 102-key AT-compatible keyboard.

There are some functions in the MK6 program that work only if an external keyboard has been connected. This is the case for most of the external applications that can be run from within the MK6 program.

2.4 ADJUSTING LCD SCREEN CONTRAST

LCD screen contrast and brightness depends upon temperature and battery voltage. You may, from time to time, find it necessary to adjust contrast or brightness. To adjust the contrast, you press **\<SHIFT\> + \<+\>** or **\<SHIFT\> + \<-\>** keys. If the display is completely unreadable when TERRALOC starts up (black on black), press **\<SHIFT\> + \<+\>** or **\<SHIFT\> + \<-\>** keys until the display is satisfactory. When you are in the Main Menu you may just press **\<+\>** or **\<-\>** to adjust the contrast.

2.5 WHICH KEYS ARE USED FOR DIFFERENT FUNCTIONS

Arm	**\<ARM\>**
Break printouts	**\<ESC\>**
Delete the character under the cursor	**\<BACKSPACE\>, \<SHIFT\> + \<BACKSPACE\>**
Deselect all items in a list	**\<CTR\> + \<BACKSPACE\>**
Disarm	**\<ESC\>**
Execute a command	**\<ENT\>**

LCD contrast adjust	`<SHIFT>+<+>`, `<SHIFT>+<->` (or in the Main Menu: `<+>`,`<->` only).
Mark first arrivals	`<.>`
Move timelines	`<+>`, `<->`, `<CTR> + <+>`, `<CTR> + <->`
Move between fields	`<TAB>`, `<SHIFT> + <TAB>` should normally be used. Note that a box within a menu is treated as a field. Many times `<ARROWS>` and `<SHIFT> + <ARROWS>` work also.
Move inside fields (and boxes)	`<ARROWS>`, `<SHIFT> + <ARROWS>`.
Move trace marker	`<LEFT>`, `<CTR> + <LEFT>`, `<RIGHT>` `<CTR> + <RIGHT>`
Next/previous trace	`<RIGHT>`, `<LEFT>`
Open pop-up lists	`<SPACE>`
Scroll traces, lists etc.	`<UP>`, `<SHIFT> + <UP>` `<DOWN>`, `<SHIFT> + <DOWN>`
Select/deselect choices	`<ENT>`
Select all items in a list	`<CTR> + <ENT>`
Set timebase for relative time	`<0>`
System setup	`<CTR> + <ESC>`
Toggle choices	`<SPACE>`
Trig (from the TERRALOC)	`<CTR> + <ARM>`

2.6 USER INTERFACE VOCABULARY IN TERRALOC MK6

Some terms used in this manual are defined below:

border	All menus are surrounded by a border. It contains a header, a prompt and scroll bars.
box	It is a low level type of menu, always contained inside an ordinary menu and treated as a field.
button	A field usually surrounded by angle brackets. It is the control for a command.
command	A command is an executable function, i.e. when the button of a command is selected and `<ENT>` pressed, some desired action is performed. In some

cases there might be several functions for a command. If so, these functions are listed in a pop-up menu.

current field   A field is the current field when the cursor is placed on it.

field   Fields are the active parts of a menu. When you move the cursor around, it is always placed in some type of field. There are the following types of fields; buttons, pop-up lists, numerical fields, text fields etc. Sometimes a field is disabled and can not be selected. If so, the function of the field is not valid depending on values of other fields.

header   Contains the name of the menu and is displayed in the top line of the menu.

menu   All data input, execution of functions etc. are made through menus. A menu is displayed inside a window. Normally the components of a menu is: *header, border, text, field, box and prompt.*

pop-up list   When there are more than two choices they are placed in a list. To open the list, press <SPACE>. Select the item you want and press <ENT>. If you want to close the list without making a selection, press <ESC>.

pop-up menu   Some commands have more than one function and these are listed in a pop-up menu. When executing the command it opens the pop-up menu where you make your selection and press <ENT>. In most pop-up menus the items are numbered. If you press the number corresponding to an item, this item is executed immediately.

prompt   Shows a brief explanation of the current fields function. It may also contains the valid range of parameters.

scroll bars   Displayed as part of the border (right and/or bottom) and is used to scroll the menu (window) when using a pointing device such as a mouse.

text   All menus contain text. It can not be selected and is for information only, e.g. showing what value should be entered in a field.

toggle   When a parameter has only two values, you toggle between them by pressing <SPACE>.

window   A window is the appearance of a menu on the screen. Everything displayed on the screen is displayed in a window.

2.7 GENERAL VOCABULARY

Acquisition memory   The memory where recorded data are saved before being transferred to the trace memory.

General Protection fault   Also called "GP-fault". The processor detected a severe violation caused by program error. This means that the program is halted

and control is returned to MS-DOS. Before returning, the program tries to save data (if there is any in the trace memory).

Preview stack   When data are recorded in preview mode, they are stacked in a separate part of memory, the so called preview stack.

Trace memory   The memory where data are stacked. It is the data in the trace memory that is saved to disk, displayed and printed. The status (on/off) of the trace memory for each trace is controlled by the "Stack On" parameter.

TTL   TTL stands for Transistor-Transistor-Logic. Used in connection to digital signals. A digital signal is considered to be either a logical 0 or a logical 1 (hereafter only called 0 and 1). Physically a 0 corresponds to voltage of 0-0.7 V, while a 1 corresponds to a voltage of 2.8-5.0 V. Alternatively, a 0 might be called "low", and a 1 called "high"

2.8 WHICH PRINTERS CAN BE USED

The TERRALOC supports a wide range of printers. The printer drivers are really Dynamic Link Libraries (DLLs), which means that there will be drivers for more printers available in the future. Some of the printers supported are:

Epson FX-80
Epson FX-85
Epson FX-286
Gulton Superplot-80
HP DeskJet 500
HP LaserJet+
IBM Proprinter
Panasonic KX-P1083
Panasonic KX-P4450
PenPlus
Seiko DPU-411
Seiko LTP-5442

The list could be much longer, and any printer that is compatible with any of the above can be used.

Output for printing can be sent to the parallel or serial port.

2.9 GETTING STARTED

In this section we will make a measurement of noise. It will give you insight in how easy it is to set your TERRALOC up for operation and it will need no more equipment than the instrument itself and the power supply. Should you feel uncertain during any of the steps below, you can press <HLP> to get access to the context sensitive cross reference help system. It can be recommended to try this

anyhow, to learn how the help system works (see page 9-1 for more information about the cross reference help).

- Connect the power supply and switch on the instrument.

- Some diagnostic messages shows up on the screen during the start up tests. Please note, that it is not possible to stop the memory tests by pressing <ESC> on the internal TERRALOC MK6 keyboards. To do this you must connect an external AT-keyboard.

- After approx. 30 seconds, a message will be displayed with information about the software version used, when it was compiled and the serial number of the instrument. Press <ANY KEY> to remove this message (or just wait 10 seconds or so).

- Now you are in the main menu. Try press <+> and <->, and see what happens with the contrast of the display. Adjust the contrast until you find the best setting in the prevailing light conditions. You will probably have to change the contrast level from time to time depending on temperature.

- Press <ARM> and the measure menu will appear.

- Using the <TAB> key, move the cursor to the settings command and press <ENT>. This opens a sub-menu, containing a list of five choices.

- Select "2 Sampling Parameters" using the <TAB> and <ENT> keys, or press <2> directly.

- Move around the menu by using the <TAB> key. Note the prompt line of the sampling parameters menu. This line shows how to enter values for current field selected by the cursor. Lists with values are accessed by pressing <SPACE>, and items are selected by using <ARROW> keys and <ENT>. <ESC> closes a list without making any selection. In the other fields you type in values directly, using the numerical keys. Before accepting the current settings, make sure you have the stacking mode set to "Auto stack". To accept entered values, move the cursor to the <Ok> field, and press <ENT>.

- Now press <ARM> again. This arms the instrument and makes it ready to receive a shot. A row of asterisks shows the allocation of stack memory, and a message in the status line (bottom of the screen), will tell you when the instrument is armed.

- Press <CTR>+<ARM> to trig the instrument. A message "* * * * * TRIGGED * * * * *" is displayed in the status line.

- Now the data are scaled and displayed in the trace window.

- Trig once more by pressing <CTR>+<ARM> and see what happens! - The traces on the screen are replaced with a new set that look a little different. What you see now is the average of the two measurements made so far.

- Press <ESC> to disarm the instrument (a message "Disarming..." shows for a short while). Or, you can press <SAVE>, and have the data saved to disk!

- When the instrument is disarmed, you can either select "1 Clear" to erase the recorded data, or press <SAVE> to save the data to disk.

- Before leaving the measure menu, note the numbers preceding the commands and sub-menu choices. These are so called, quick access numbers. You select a "numbered" item, by pressing the corresponding number. Try this!

- To leave the measure menu, press <ESC>. The program asks a question, "Close window?". Select <Yes> to return to the main menu. If data has not been saved to disk, or erased from memory, you will be asked if data should be saved before return to the main menu. Select <No> if you do not want to save the data.

- When you are finished getting acquainted with the instrument, you may exit the program. Select "File" in the main menu, select "Exit" in the sub-menu, and answer yes to the question, if you want to end the session. Wait until the MS-DOS prompt shows up, before switching off the system.

Now you should have learned a little about how to operate the instrument and navigate between the different menus. Do not be afraid to test different settings and modes. Please refer to the reference manual, should you get stuck in any menu. There is no risk of causing any damage. Should you somehow get problems with the TERRALOC MK6 software, you can just reinstall it (see page 1-5). However, you should NOT make any changes in the following directories:

- C:\DOS
- C:\MK6
- C:\MK6\SYS
- C:\MK6\HELP

2.10 KEEP UP THE GOOD PRACTICE

In order to have a well kept system, there are a few things that should be done or maintained regularly.

- Make backup copies of your data as soon as possible after acquisition. You never know when data are destroyed, either by a user mistake (deleting or overwriting files), or a harddisk crash.

- Delete the record logfile (C:\MK6\SYS\RECORD.LOG) at regular intervals (e.g. twice a year). The length of the intervals depends on the amount of work done with the instrument. This file grows with each record saved to disk, and will eventually occupy too much of the disk space.

- Run a harddisk diagnostic program, to locate any bad sectors. Long-time use wears the harddisk, and eventually, there might be some bad sectors.

- Run a harddisk defragmentation program. After a long time of creating and deleting files, this will increase the performance of the disk.

- Run anti-virus software. While this is an open system where you can run any PC-software, there is also a risk of introducing computer viruses. The TERRALOC MK6 software is thoroughly checked before shipping.

- Keep the connectors clean. The connectors are sealed, but dirt in the connectors may cause bad connections.

- Do not input high voltages into any connector as this might damage the electronics.

- Keep the connectors covered when transporting the instrument.

Table 2.1   *Key equivalents between Terraloc Mk6 internal keyboards and external AT-compatible keyboards.*

TERRALOC MK6	AT-keyboard
HLP (HELP)	F1
ARM	F2
SAVE	F3
PRN (PRINT)	F4
SHIFT + BACKSPACE	Delete
SHIFT + SPACE	Insert
SHIFT + DOWN	Page Down
SHIFT + UP	PageUp
SHIFT + LEFT	Home
SHIFT + RIGHT	End
SHIFT + HLP	Shift + F1
SHIFT + ARM	Shift + F2
SHIFT + SAVE	Shift + F3
SHIFT + PRINT	Shift + F4
CTR + HLP	Ctrl + F1
CTR + ARM	Ctrl + F2
CTR + SAVE	Ctrl + F3
CTR + PRN	Ctrl + F4
CTR + ESC	Alt + Esc
CTR + TAB	Ctrl + Tab
CTR + DOWN	Ctrl + Down
CTR + UP	Ctrl + Up
CTR + LEFT	Ctrl + Left
CTR + RIGHT	Ctrl + Right

Chapter 3

3 PROGRAM MENUS AND DISPLAYS

You make all ABEM TERRALOC MK 6 menu selections, entries, and settings through on-screen menus using the two keypads. When in your office you may, if more convenient, connect a standard PC-AT keyboard and a mouse.

Before starting any field work, you should invest time to go through this reference manual and familiarise yourself with the various menus screens and options. These are described here in detail. If you switch on the field unit with no external connections other than the power supply, you will be able to view the screens as you read their descriptions.

3.1 START-UP SCREENS

On start up, ABEM TERRALOC MK 6 runs an internal system check. Some five copyright messages display; you also see two RAM memory tests. If you have an external PC-AT keyboard attached you may, if you wish, press ESC *on the external keyboard* at any time to stop the memory test. Pressing ESC on the TERRALOC MK6 internal keyboards, have no effect on the memory test. After loading of all programs and utilities, the ABEM copyright screen displays for about 10 seconds, unless you press any key, before the main selection menu shows. The copyright screen shows your User Licence Serial number. You should have this number available when you wish to talk to ABEM about your TERRALOC program. The serial number is written to the program during installation, and it is also the serial number of your TERRALOC MK6.
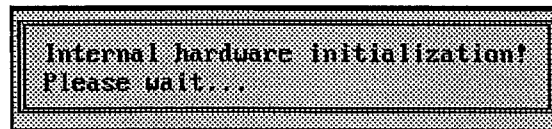
Figure 3.1   *Program hardware initialization, takes approx. 4 seconds.*

The first time the program runs after the installation, a system definition menu (page 3-5) is displayed. The user must make sure that all the parameters are correct before leaving this menu, to get the correct settings of the system. All parameters in the System Definition Menu are set as part of the thorough testing program before delivery.

You only have to set the parameters in the System Definition Menu if you reinstall (or update) the MK6 software. For more information, see section 3.4.

3.2 WORKING WITH THE MAIN MENU COMMAND LINE.

3.2.1 MAIN MENU SCREEN

The main menu screen (Figure 3.2) comprises four parts; a version line, a menu bar with pull-down menus, a background window and a status line. In addition to this a system settings information window can be shown on the lower right corner of the screen.

Version line

" TERRALOC MK6 Ver 2.12   C:\DATA   12.5V"

The version line, displayed at the top of the screen, shows the software version number, current working directory, and actual supply voltage. If this voltage falls to 10 V the word LOW appears to the left of the voltage value.

This warns you to change or check the external DC source. If you allow voltage to fall to below 10 V, your TERRALOC will shut down. If the voltage rises to above 30 V, the TERRALOC is automatically switched off. In case this happens, just switch off the power switch, change the power supply and switch the instrument on again.

As ABEM product development is continuous, version upgrades may be produced periodically. As a registered user (make sure you have mailed the Warranty Registration Card back to ABEM!) you qualify for version upgrade disks at a nominal charge

Main Menu Bar
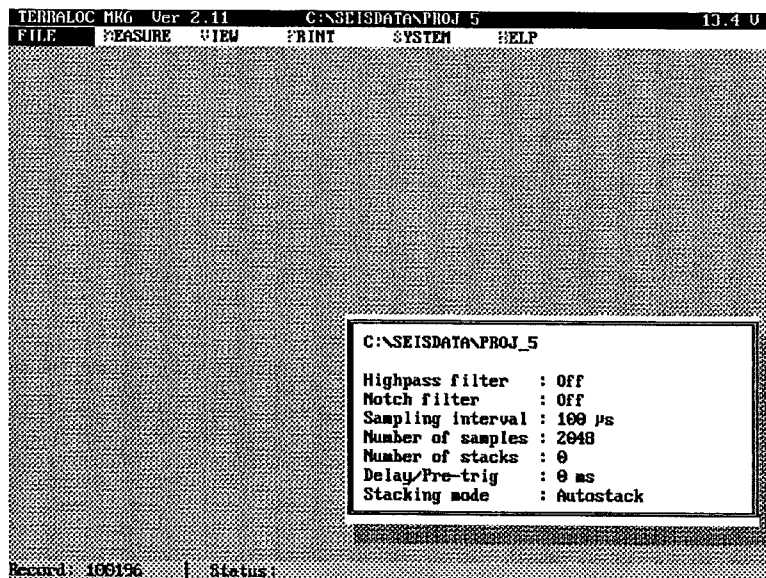
Figure 3.2   *The main menu.*

The six command line menus with their pull-down menus are:

FILE

- *File Manager*	Copy and delete files, make and remove directories and format disks.
- *External Applications*	Run applications defined in the External Applications Definition File.
- *DOS Shell*	Exit to DOS Shell (should be used for temporary exit only).
- *Exit*	Saves all parameters and exits the program. This is the proper way to end a session, before switching off the TERRALOC MK6.

MEASURE:

- *Measure*	Starts the measure program.

VIEW

- *Data*	View data stored on disk, frequency analysis, first arrivals, digital filtering.
- *Geophone test file*	View report forms generated by the geophone test. It shows eg. the resonance frequency and damping of the geophones.
- *Text Files*	View ASCII text files.
- *Options*	Set options for the view data menu (can be set from inside View Data also).

PRINT

- *Data*	Print one or more data files (selected from a file list).
- *Geophone test file*	Print one or more geophone test files (selected from a file list).
- *Files*	Print one or more file (selected from a file list).
- *Options*	Select printer type, printer port, resolution etc.

SYSTEM

- *Setup*	Opens the System Setup Menu for setting of system parameters.
- *Serial Comm.*	Setting of parameters for serial communications port.
- *Set Date & Time*	Setting of the systems real time clock..
- *Color palette*	Change colors for the window system. Save and load color palettes as files.

HELP

- *Cross-reference*	Opens the index of the context sensitive cross-reference help system.
- *Error Messages*	Opens the cross-reference help for error messages.
- *File Formats*	Opens the help texts on file formats.
- *Mk6 Manual*	Opens the help texts of the MK6 manual.
- *About...*	Some information about the TERRALOC MK6.

Status line

The item Record shows the current record number. This number is used to create filenames when saving data. If ###### represents the six digit record number, the data filename becomes ######.SG2. There are several filename extensions depending on the file type (e.g. first arrivals file, geophone test report, etc.).
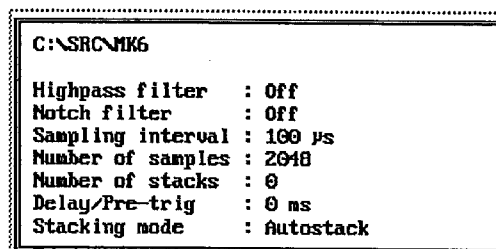
The Status item displays the current system status of TERRALOC and shows you the current activity in the system. Some of the status messages are:

Copying files ...
Deleting files ...
Processing...
Reading data...
Saving data...
Scaling trace number 15
Making FFT...
Plotting...
ARMED!
* * * * * TRIGGED * * * * *

System settings information window

If, in the System Setup menu, "Info box" is set to YES, a window showing some system settings will be displayed at the lower right corner of the screen (Figure 3.3). This window contains information about the current working directory and sampling parameters settings.

```
C:\SRC\MK6

Highpass filter    : Off
Notch filter       : Off
Sampling interval  : 100 µs
Number of samples  : 2048
Number of stacks   : 0
Delay/Pre-trig     : 0 ms
Stacking mode      : Autostack
```

Figure 3.3   *The TERRALOC MK6 system settings information window.*

3.3 SELECTING MENU COMMANDS

Press <TAB> or <SHIFT> + <TAB> to cycle forward or backward through command line. When a menu is active, it highlights white text on black background. To open a drop-down menu press <ENT>. The first command highlights by default; to activate it you press <ENT>. Use <TAB> or <SHIFT> + <TAB> ; this cycles through all the commands. When a command highlights, press <ENT> to select it. To close a pull-down menu, press <ESC>. In addition to this you can use <ARROWS> to navigate among the pull-down menus.

In the main menu bar and its pull-down menus you can see a highlighted character in each command. These can be used if you have an external keyboard connected. Just type the letter that corresponds to the command you want to execute. If a pull-down menu is activated, the focus of these short-cut keys is on the pull-down menu and not on the menu bar. E.g. type V D to View - Data and F X to exit the program (File - Exit).

3.4 THE SYSTEM DEFINITION MENU

When you start the program the first time after the software has been installed, a system definition menu appears. In this menu, you specify the hardware configuration of the seismograph. On exit from the menu, the hardware and software are calibrated for optimum performance. During the time the message "Calibrating system! Please wait ..." is displayed, you **must not** press any key.

You will not get into this menu the first time you use the instrument after delivery, because the program is run and tested before delivery of TERRALOC MK6. However, if you reinstall the software (using the automatic installation procedure), or if you make a software update, you will have to check the settings of this menu. If the need should arise to do a system calibration, it is possible to do so by connecting an external keyboard and press <F12>.

```
TERRALOC MK6  Ver 2.11        C:\SEISDATA\PROJ 5                13.4 V
FILE      MEASURE   VIEW    PRINT      SYSTEM      HELP




                   ──── SYSTEM DEFINITION ────
        Notch filter is calibrated for:   50  Hz

        Number of channels installed:     24

        MK6 descaling factor:             0.00024     mV/unit

        MK6 input impedance:              3500.000  Ω

       Press <SPACE> to toggle                            ctave
                                  Notch filter    : OFF
                                  Sampling interval : 100 µs
                                  Number of samples : 2048
                                  Number of stacks  : 0
                                  Delay/Pre-trig    : 0 ms
                                  Stacking mode     : Autostack

Record: 100196    Status:
```

Figure 3.4   *System definition menu.*

Notch filter is calibrated for:	When data are saved in the SEG-2 format, the use of notch filter during data acquisition, is indicated by the notch frequency in the NOTCH_FILTER keyword. However, the Terraloc has no way of telling what frequency the notch filters have been calibrated for, so you have to enter what notch frequency you specified when ordering. Press <SPACE> to toggle the values (50 and 60 Hz). The default value is 50 Hz. You need to change, only if you have ordered the Terraloc to be delivered with 60 Hz notch filter.
	Please note, that you do not change the notch frequency in this menu! You just select information to be put into the SEG-2 file headers.
Number of channels installed:	Press <SPACE> to get a list of the available alternatives. Select the number that corresponds to the number of channels installed in your Terraloc. The default value is 24 channels. You need only change this value if you have a different number of channels installed.

MK6 descaling factor: This is a floating point number used to get the voltage in millivolts from the sample value. As this value depends on the internal electronics, it should normally never be changed.

MK6 input impedance: This is a floating point number used in calculations to get the particle velocity at the geophone. As this value depends on the internal electronics, it should normally never be changed.

Chapter 4

4 FILE MENU

In the file menu you will find

- File Manager	Copy/delete files, make/remove directories and format disks.
- External Applications	Run applications defined in the External Applications Definition File.
- DOS Shell	Exit to DOS Shell (should be used for temporary exit only).
- Exit	Saves all parameters and exits the program.

4.1 FILE MANAGER

Select this to access the file handling screen (see figure 4.1). On the right, there are six command buttons that contains the actions that can be performed in the File Manager.

<Copy>
<Delete>
<MkDir>
<RmDir>
<Format>
<Cancel>

Filespec.	This field specifies the files to list in the source directory window. The wildcard is a pattern which filenames should match. In the wildcard pattern, a '*' represents any number of characters and a '?' represents a single character (more information about wildcards can be found in the MS-DOS User's Guide). To edit this field, you may either press **<SPACE>** to get a list of pre-defined wildcard patterns or type the wildcard pattern directly.
Source Directory	This is the path to the current directory, from which you can copy and delete files and where you can create new sub-directories. It is also the directory which may be removed by <Rmdir>.
Target Directory	The path to the target directory where files will be copied. You must make sure that the target directory is not the same as the source directory, otherwise the copy operation will fail.
Files	The files contained in the source directory that matches the file specification. You can select files by moving the cursor to a filename and press **<ENT>**. Selected files are highlighted. To deselect a file, select a highlighted file and press **<ENT>**. **<CTR>+<ENT>** selects all files in the directory, while **<CTR>+<BACKSPACE>** deselects all files.

Directories	The contents of the source directory; sub-directories and disk drives (e.g. [-A-], [-C-] etc.). The directory "." represents the current directory and ".." represents the parent directory, i.e. the directory above the current.
Target	All sub-directories and disk drives under the target directory.
Copy	Copies marked files from the source directory to the target directory. The target directory must be different from the source directory. If a file exists in the target directory with same filename as the one being copied, you will be asked if it is OK to overwrite the contents of the target.
Delete	Deletes marked files from the source directory. It is not possible to delete files that are read-only.
MkDir	Creates a new directory under the current working directory. A new directory can not be created if there is a directory or a file with an identical name as the one you want to create.
RmDir	Removes the current working directory. The directory to be removed must be empty, i.e. it must not contain any files or sub-directories.
Format	Formats diskettes. Opens up a menu for formatting of diskettes.
Cancel	Exits the File Manager.
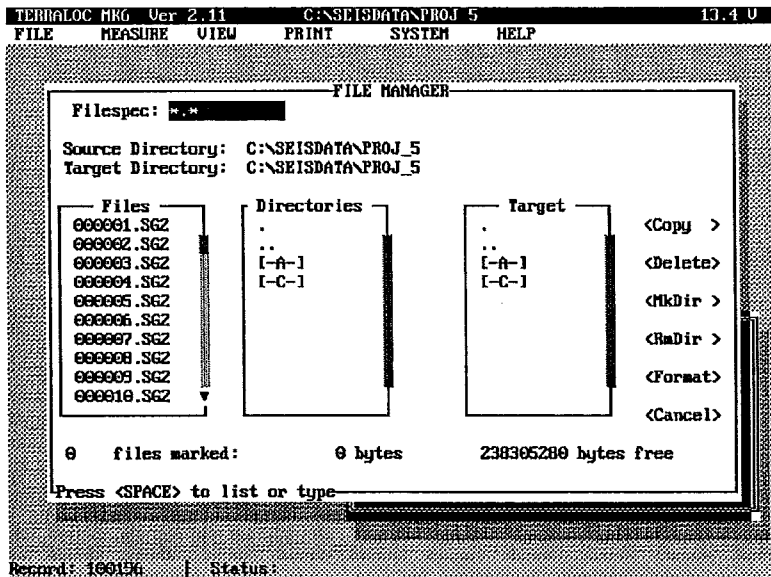
Figure 4.1   *The File Manager Menu.*

In the Files, Directories and Target boxes, <ENT> is used to select/deselect the item in the current field. In the Files box, <CTR> + <ENT> can be used to select all files, and <CTR> + <BACKSPACE> can be used to deselect all selected files. The maximum number of files that can be listed in the Files box is 1024.

4.1.1 DIRECTORY LISTS

To change to a desired directory or disk drive, highlight appropriate directory/disk drive and press <ENT>.

NOTE! If you change source directory, this will also be the new working directory. This is reflected by the path shown in the program title line (top of screen).

Standard TERRALOC directories are

DATA
DOS
EXAMPLES
MK6

Disk drives always present are

[-A-]
[-C-]

If you select a disk drive such as [-A-], and the drive is not ready (no disk is inserted etc.), you will get an error message:

"Disk A: not ready!".
<Retry>   <Abort>

Then you may insert a disk and select <Retry>, or if you do not want to change to that drive, select <Abort>. However, if this message should come when you select the harddisk ([-C-]), there is probably a serious problem with your harddisk.

To create a new directory under the current directory choose <MkDir> command. To remove the current directory choose <RmDir> command. When removing the current directory, it must be empty.

4.1.2 COPY FILES

Change to the directory from where you want to copy, mark the file or the files you want to copy in the "Files" box. Then, select target directory. It cannot be the same directory as the source directory. Highlight <Copy> and press <ENT>. A copy dialogue box shows the number of files selected and source and destination paths. If the information is correct select <OK> and press <ENT>. Copying starts and a copy progress box shows. If the paths are not correct or you would like to copy other files, press <ESC> or select <CANCEL> and press <ENT> to cancel your copy selection. If there already is a file on the target with the same filename as the one to be copied, you have to verify that it can be overwritten. The message is

"File *path\filename.ext* already exists! Overwrite?"
<Yes>   <Yes to all>   <No> <Cancel>

If you answer <YES TO ALL>, all files already existing on the target will be overwritten, without further warnings.

It is not possible to move or rename files. If you want to move files from one directory to another, you have to copy the files to the target directory first, and then delete the files from the source directory.

4.1.3 DELETE FILES

Change to the directory from which you want to delete, mark the file or the files you want to delete in the "Files" box. Highlight <Delete> and press <ENT>. A delete dialogue box shows the number of files selected and source path. If the information is correct select <Ok> and press <ENT>. Deleting starts and a delete progress box shows. If the paths are not correct or you would like not to delete some files, press <ESC> or select <Cancel> and press <ENT> to cancel your delete selection.

The delete operation starts with a message

> "Delete *path\filename.ext* ?"
> <Yes> <Yes to all> <No> <Cancel>

This gives you a chance to delete the selected files one at a time (Yes), all at once (Yes to all), skip deletion of a file (no) or cancel the operation. If you want to skip deletion of a file, you have to use <Yes> and <No> only. Once you have selected <Yes to all>, all selected files will be deleted immediately.

NOTE!   If there are files with the hidden attribute enabled, i.e. hidden files, these will not show up in neither the file manager nor any file lists. To delete hidden files, you must exit the MK6 program and delete these files from DOS.

4.1.4 CREATE A NEW DIRECTORY

Make the directory under which you want to create a new directory your current directory. Select the command <MkDir> - which stands for Make Directory - and press <ENT>. Input the name of the new directory in the window that is opened and select <Ok> to create it. If there is already a directory or file with that name, the creation fails. It is good practice to use names that make sense to you and especially to users that were not present when directories were created.

4.1.5 REMOVE A DIRECTORY

Make the directory you want to remove your current directory. Make sure that this directory does not contain any files and subdirectories. A directory must be completely empty to be removed. Select the command <RmDir> - which stands for Remove Directory - and press <ENT>. If the directory is not empty, the operation fails and you see an error message.

NOTE! If there are files with the hidden attribute enabled, i.e. hidden files, these will not show up in neither the file manager nor any file lists. To remove a directory containing hidden files, you must exit the MK6 program and delete these files from DOS.

4.1.6 FORMAT DISKS

To format a floppy disk, highlight <FORMAT> and press <ENT>. The Format Disk Menu is opened (Figure 4.2).

```
┌──────── FORMAT DISK ────────┐
│                             │
│ Disk type:     1.44 MB      │
│ Quick format: No            │
│ System Disk:   No           │
│                             │
│ Volume label:               │
│                             │
│        <FORMAT>    <EXIT>    │
│                             │
└─────────────────────────────┘
```
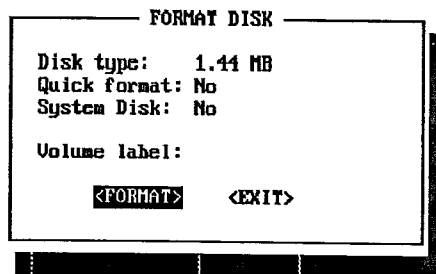
Figure 4.2   *The Format Disk Menu.*

Disk type
: The type of disk to format. In the TERRALOC MK6 you can format two types of disks, 720 kB (double density, DD) and 1.44 MB (high density, HD).

Quick format
: Deletes the file allocation table (FAT) and the root directory of the disk. To use the quick format option the disk *must* have been previously formatted and it must be in good condition, i.e. not contain bad sectors. The quick format is much faster than normal format.

System disk
: After the disk is formatted, the files IO.SYS, MSDOS.SYS and COMMAND.COM are copied to the disk. The computer may be booted from this disk.

Volume label
: A volume label identifies the disk and can be a maximum of 11 characters. If you do not want the disk to have a volume label, leave this text field empty.

<FORMAT>
: Execute the format command.

<EXIT>
: Exit the disk format menu.

When you select <FORMAT> you will be asked: "All data on disk will be lost Proceed? <YES> <NO>". If you are sure you want to proceed, select <YES>, or else, select <NO> or press <ESC>. The formatting is performed in the DOS Shell, which means that the screen blackens temporarily. Do not panic, just wait for a minute or two and you will be back in the MK6 program again.

If formatting a disk fails, check that the disk is not write-protected. A write-protected disk can neither be written to nor formatted. Should the formatting fail anyway, check that the file C:\MK6\SYS\DSKFMT.INP exists. This file is used to supply input to the MS-DOS FORMAT command (the input usually supplied by the user pressing keys).

4.2 EXTERNAL APPLICATIONS

When you highlight and select External Applications in the File Manager main window, the Run External Applications screen shows Application: Press <SPACE> to list whatever external applications are available. These could be, for example, Check Disk, DOS Edit, Memory Statistics, and so on.

In the file C:\MK6\SYS\APPS.LST, which is an ASCII text file, you define the external applications that may be run from the TERRALOC MK6 program. The file format definition is in Appendix A. The default assumes use of an external keyboard. You may override this in the definition file. If the application requires a mouse, this can also be defined in the file. Note, however, that the MK6 program uses quite a lot of memory even when left pending, so you have less free memory when using the external application function than if you exit from the MK6 program and runs the application from DOS directly.

Normally, external applications do not recognise the MK6 internal keyboards. Thus, you are required to have an external keyboard connected when running external applications from within the MK6 program.

A typical file definition would include your most used processing and interpretation programs. These
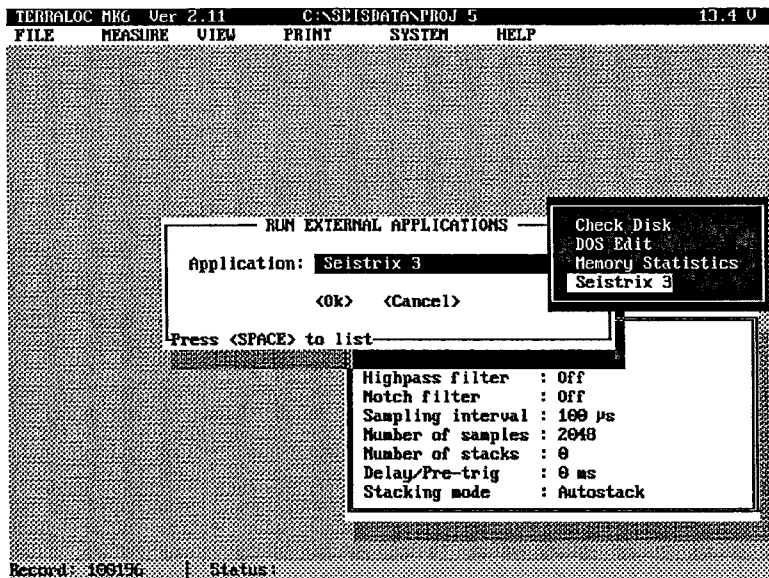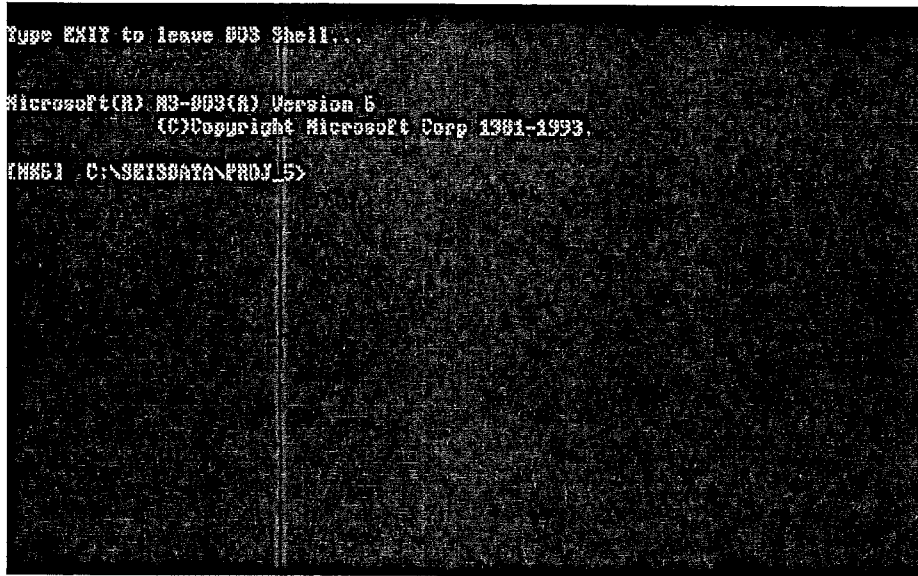
Figure 4.3   *External applications menu.*

will then be readily accessible when working with the TERRALOC. Multitasking is not possible, so you are not able to simultaneously acquire data and process it.

4.3 DOS SHELL

Select this to temporarily leave the TERRALOC program. To return to the program from DOS Shell, type EXIT and press <ENTER>. You must connect an external keyboard to work in the DOS Shell, the TERRALOC keyboard is not usable.

Figure 4.4   *Leaving the MK6 program temporarily (,to the DOS Shell).*

From the DOS prompt you may run any DOS program. Note you have less free memory than when you use the Exit Program command.

4.4 EXIT PROGRAM

Select File - Exit to quit the TERRALOC program and return to MS-DOS. An alert shows (see Figure 4.5).

Press <ENT> to exit to MS-DOS or select <NO> and press <ENT> (or just press <ESC>) to stay in the TERRALOC program. If you end the session, TERRALOC automatically saves current settings and system parameters in the current working director. If you exit you may return to TERRALOC program from MS-DOS either by

    1   Typing MK6 at the prompt from a PC-AT keyboard, or

    2   When no external keyboard is available by switching off TERRALOC and switching it on again.

Figure 4.5   *The proper way to exit the program.*

✓ IMPORTANT!   You should make it a habit to exit the program this way before switching off the Terraloc. Failing to do so, might lead to startup problems the next time you use the Terraloc, because all system parameters are saved on exit. Normally, the system parameters are saved periodically, but if this automatic save is active when you switch off the Terraloc, the system files might become corrupted.

Chapter 5

5 MEASURE MENU

In the Measure Menu you will find:

> *- Measure*   Starts the measure program.

The only item under MEASURE is also called Measure. In the main menu, you can press **<ARM>** to get quick access to the Measure menu.

You exit the menu by pressing **<ESC>** and answer YES to the question "Close window?". If there is unsaved recorded data in the trace memory, you will be asked to save the data first.

5.1 THE MEASURE MENU SCREENS

The centre of the screen has three sections (Figure 5.1). The top window is the information window, the right one is the command window and the largest is the data window. If one or more of the commands is greyed out, then it is not active at that instant.

Figure 5.1   *The Measure Menu*

5.1.1 INFORMATION WINDOW

The information window contains information about current settings of important system parameters. In the header you have, besides the menu name, some additional information about the shot location. The prompt shows the channel status - if a channel is active it is indicated by an X, and if it is inactive it is indicated by a dash (-). Additionally, in optimum offset mode, all traces containing data are indicated by a $ in the channel status prompt. If the instrument is set for automatic re-arm between records, the text "Auto re-arm!" is shown in the prompt. In the bottom line of the window there are three fields that are equal to the View Data Menu. These fields are; "Trace" - number of the current trace, "Time" - the time in milliseconds that corresponds to the position of the timeline, and "Amplitude" - the amplitude of the sample in the current trace at the current position of the time line. These fields are active only when the instrument is not armed.

5.1.2 COMMAND WINDOW

The command window is comprised of nine command buttons, each preceded by a quick access number. Use <TAB> and <SHIFT>+<TAB> to move between the buttons, or press the number corresponding to the desired command. The available commands are listed below, and more information can be found in the indicated sections:

5.3	Clear	Clears the trace memory for single trace, active traces, all traces or whole record (including re-initializing of the record).
5.4	Settings	All parameter settings related to the data acquisition.
5.5	Set Trig	Settings for arm/trig input and output.
5.6	Noise	Set parameters for noise monitoring and check the noise monitor. The noise monitor contains also a simple geophone check.
5.7	Display	Set the options for viewing data.
5.8	Re-stack	Read an old record from disk. You may continue to stack on this record.
5.9	Load set	Load settings from disk.
5.10	Save set	Save settings to disk
5.11	Tools	Accesses a pop-up menu with some useful tools, e.g. geophone test.

When the TERRALOC is armed, all commands except "display" are disabled. Depending on the status of TERRALOC - if there are data in memory etc. - some fields in submenus may be disabled.

5.1.3 TRACE WINDOW

All data are displayed in the trace window. It is a graphical window.

The border of the trace window contains; one close box and four scroll boxes. These items are used by a mouse if connected. If you click on the close box, it is interpreted as <ESC> was pressed. The clicking on one of the four scroll boxes equals pressing the corresponding <ARROWS>, and if you double click, it corresponds to <SHIFT>+<ARROWS>.

After data have been acquired, the data are plotted vertically with trace 1 on the left and the last trace at the right. To the left of the traces there is a time scale. Time marker lines are

plotted horizontally. The distance between the tic marks in the time scale and between time marker lines depends on the sampling interval and number of samples per pixel selected in the display options.

You can scroll the displayed traces using the {<DOWN>|<UP>} keys (use <SHIFT> + {<DOWN>|<UP>} keys to scroll one screen at a time) and move the time marker line with the <+> and <-> keys. When the time marker is active, the time corresponding to the position of the time marker is displayed in the information window. Besides, the amplitude of the sample at that time position and for the current trace is displayed. You select the current trace with the {<LEFT>|<RIGHT>} keys and the current trace number is displayed in the information window. To move to the first and last trace respectively, press <SHIFT>+{<LEFT>|<RIGHT>}. If the TERRALOC is armed, you can neither scroll traces nor select current trace.

5.2 KEYBOARD FUNCTIONS IN MEASURE MENU

These keys are specific to the Measure Menu. All other keys work as normal.

<ARM>   Initializes memory, prepares a record and puts the instrument in armed mode, ready to receive a trig signal. If the noise monitor is active, the noise will be displayed. The status line shows:

[ARMED!]

<CTR>+<ARM>   If the instrument is armed, <CTR>+<ARM> acts as instantaneous "software" trig. When the instrument has been triggered and is transferring data to the trace memory, the status line shows:

[* * * * * TRIGGED * * * * *]

<ESC>   If the instrument is armed, <ESC> will disarm, else you will asked if you want to close the window. You will be notified that the instrument disarms by a message on the screen.

<CTR>+<ESC>   Access the System Setup Menu. In this menu you can change the current record number, number of active traces, autosave pareameters etc.

<SAVE>   Saves the data using the current record number to create a filename. After data are saved, the record number and all appropriate parameters are updated. Depending on the settings of auto save, auto overwrite, remove DC-offset on save and save settings in the system setup menu (see section 8.1), this command will behave in slightly different ways.

As a measure of safety, all system parameters are saved when this key is pressed. However, you should still always exit the program the proper way (see page 4-7)

5.3 CLEAR

Sometimes it can be useful to clear the stack memory of bad data. It may happen that data just acquired is bad, or that you received a false triggering. With the clear command, you have a set of different methods to clear data from memory. After you have selected a method, you will be asked to accept that the data will be cleared. Accepting, means that the data will be lost for ever. After the clear operation, data are rescaled. Please note that, clearing data in the preview and fast stack modes, the operation will not be reflected to the screen, while no stacked data are displayed.

5.3.1 CLEAR CURRENT TRACE

Clears the trace selected by the trace marker. In this way, you can easily select which trace to clear.

5.3.2 CLEAR ACTIVE TRACES ONLY

Clears all traces that are active, ie. having the "stack on" parameter in the receiver spread menu set to '1'. If you are going to clear several traces, it might be easier and faster to vlear active traces only. Got to the Receiver Spread Menu and set "stack on" to '0' for the traces you want to keep. Then do "Clear Active Traces Only" and reset the "stack on" parameters to the desired status.

Figure 5.2   *Clear traces menu.*

5.3.3 CLEAR ALL TRACES

Clears all traces in the stack memory disregarding any settings of the "stack on" parameter. This is almost the same as "Clear And Reinitialize Record", but it clears only the trace memory and stack counter. After doing "Clear All Traces" you cannot change any acquisition parameters, these will still be disabled.

5.3.4 CLEAR AND REINITIALIZE RECORD

Clears all traces and resets all parameters for the current record. The record number is not updated. Use this function if you discover erroneous data acquisition settings and have to change some settings while having no desire to save the record.

5.4 SETTINGS

The Settings command is a pop-up menu which has five menus that allow you to enter the parameters you use for a survey

<1> Receiver Spread	Assign channels, set polarity and assignment.
<2> Sampling Parameters	Set sampling parameters; sampling interval, number of samples, stack mode etc.
<3> Layout Geometry	Select type of layout (standard, roll-along, optimum offset), reference channel, shot and receiver locations and move-ups.
<4> Analog Filters	Select analog highpass and notch filters.
<5> Text	General information to accompany data in the file.

5.4.1 RECEIVER SPREAD

For flexibility, speed and convenience in setting up the unit for different types of surveying, TERRALOC has integral monitoring and logical control of the receiver spread (see figure Figure 5.3). This includes polarity, connection, allocation of channel to trace, position re-naming, etc. Columns show for the first and second half of the installed number of channels.

Each column can display a maximum of twelve channels at the same time. If there are more than twelve channels available, they can be scrolled into the window. The *-fields are used to set the values of a whole column. In all other fields you set the value for that particular field.

Trace No.	A trace appears at a fixed position in the trace window. There are 24 traces. They are assigned numbers 1-24 from left to right in the window.
Chan. No.	This is the number of the physical input channel that will be assigned to the corresponding trace.
*:	<+> sets forward assignment, <-> sets reversed assignment.
Polarity	This parameter (+ or -) indicates whether the signal from the channel is to be added to or subtracted from the memory, i.e. signal polarity.
*:	<SPACE> toggles all values for this column, <+> sets all to '+', <-> sets all to '-'.

```
TERRALOC MK6   Ver 2.11          C:\SEISDATA\PROJ 5                    13.4 U
┌──────────────── MEASURE  (shot at: X=0.00, Y=0.00, Z=0.00)────────────────┐
│ Interval:  100 µs   2048 (204 ms)                      Mode: Autostack    │
│                          ──────RECEIVER SPREAD──────                      │
│                                                                           │
│   Trace Chan. Pola- Stack Trace      Trace Chan. Pola- Stack Trace        │
│   No.   No.   rity   on    on        No.   No.   rity   on    on          │
│ [                                                                         │
│         *      *     *     *                        *    *     *     *     │
│     1    1     +     1     1          13    13     +     1     1           │
│     2    2     +     1     1          14    14     +     1     1           │
│     3    3     +     1     1          15    15     +     1     1           │
│     4    4     +     1     1          16    16     +     1     1           │
│     5    5     +     1     1          17    17     +     1     1           │
│     6    6     +     1     1          18    18     +     1     1           │
│     7    7     +     1     1          19    19     +     1     1           │
│     8    8     +     1     1          20    20     +     1     1           │
│     9    9     +     1     1          21    21     +     1     1           │
│    10   10     +     1     1          22    22     +     1     1           │
│    11   11     +     1     1          23    23     +     1     1           │
│    12   12     +     1     1          24    24     +     1     1           │
│ Change channel order:  <+>=forward,   <->=reverse                         │
│                                                                           │
│                            <Ok>      <Cancel>                             │
└───────────────────────────────────────────────────────────────────────────┘

Record:  100196   [   Status:
```

Figure 5.3   *The Receiver Spread Menu.*

Stack on	This parameter indicates if the data from the channel is used to update the trace in memory.

> *:   **<SPACE>** toggles all values for this column, **<1>** sets all to '1', **<0>** sets all to '0'.

Trace on	Here the display of the traces is controlled. A '1' means that this trace will be displayed in the trace window.

> *:   **<SPACE>** toggles all values for this column, **<1>** sets all to '1', **<0>** sets all to '0'.

The prompt line of the menu shows which keys that are valid for each field. Use **<ARROWS>** to navigate between the rows and columns. The following prompts may be shown

*-fields

[Change channel order: <+>= forward, <->= reverse]
[Change channel polarity: <+>, <->, <SPACE>= invert]
[Set stack status: <0>=Off, <1>=On, <SPACE>= invert]
[Set trace status: <0>=Off, <1>=On, <SPACE>= invert]

Other fields

[Select channel]
[Select signal polarity (Toggle with <SPACE>)]
[Set stack Off=<0> On=<1> (Toggle with <SPACE>)]
[Set trace Off=<0> On=<1> (Toggle with <SPACE>)]

Channel Assignments

Each channel is permanently connected to one IFP-amplifier and an A/D-converter. Numbers from 1 to the number of channels included in your TERRALOC can be entered for this parameter. This parameter gives you the option of assigning the signal received from any channel to any desired trace. Note that this signal can be assigned to more than one trace. This feature is very valuable in certain applications. Note that there is one signal stack memory for each trace.

Pressing <CTR>+<TAB> in Receiver Spread Menu calls the Auto Receiver Spread Menu which can be used for automatic assignment of channels to traces. The function of the assignment depends on the number of active channels selected and the number of takeouts on the seismic cables. You can reverse the channel order for any cable and rearrange the cables when moving along your profile.

Type in channel number as needed. Entering 0 or a number higher than the number of channels available, causes a warning:

[WARNING! Value # is outside limit]

Signal polarity

The signal polarity may be plus (+) or minus (-). Plus adds signals from the channel to the memory. Minus subtracts them. Note that if you assign the same channel to different traces, you may use different polarities for the different traces. This allows simultaneously recording of S and P waves. To invert all polarities in a column at once press <SPACE> on the "*" above that polarity column; useful when doing an S-wave survey, or when one or more geophones are not correctly connected.

Stack On Parameter

Stack - may be ON (1) or OFF (0). When a stack is OFF, its trace memory is not updated. This allows you to lock the stack memory of any selected trace. Use this feature, together with channel number assignment to make a borehole log using only three geophones lowered in the hole from station to station.

Trace On Parameter

Trace - may be ON (1) or OFF (0). When a trace is OFF, its waveform is not displayed on the screen. This does not affect trace memory, only the display. Useful when you want to examine a specific trace in detail without interference from crossing traces from other channels.

Select <OK> when all are changes made and press <ENT>. You return to the Edit Settings window and may continue to set other measuring parameters.

Table 5.1   *Record lengths in milliseconds, for the available sampling intervals and number of samples.*

Sampling interval	Number of samples							
	128	256	512	1024	2048	4096	8192	16384
25 µs	3.2	6.4	12.8	25.6	51.2	102.4	204.8	409.6
50 µs	6.4	12.8	25.6	51.2	102.4	204.8	409.6	819.2
100 µs	12.8	25.6	51.2	102.4	204.8	409.6	819.2	1,638.4
250 µs	32.0	64.0	128.0	256.0	512.0	1,024.0	2,048.0	4,096.0
500 µs	64.0	128.0	256.0	512.0	1,024.0	2,048.0	4,096.0	8,192.0
1000 µs	128.0	256.0	512.0	1,024.0	2,048.0	4,096.0	8,192.0	16,384.0
2000 µs	256.0	512.0	1,024.0	2,048.0	4,096.0	8,192.0	16,384.0	32,768.0

5.4.2 SAMPLING PARAMETERS

In this window you select and set

Sampling Interval

The sampling intervals (selected in microseconds) available are: *25, 50, 100, 250, 500, 1000, and 2000*

Figure 5.4   *The Sampling Parameters Menu.*

When your choice is highlighted, press <ENT>. Note that record length in milliseconds - shown in a small inset window - changes according to sampling interval and number of samples. To see a table of the lengths records in milliseconds in respect of sampling interval and number of samples, press <HLP>.

You may select record length from short (3.2 ms) to long (32 seconds) depending on your choice of sampling interval and number of samples to be recorded.

Record length = Sampling interval x Number of samples.

If you choose a long sampling interval with a low number of samples, the resulting record file will be small (takes up less disk space), but will contain less information - your interpretation possibilities will be reduced. Conversely, a short sampling interval with a high number of samples will give you good information for interpretation, but file size will be larger. Your choice will always be a compromise. Each record consists of the selected number of samples of the receiver wave form. See table Table 5.1 for the available record lengths, and table Table 5.2 for size of data files.

Number of Samples

The available choices of number of samples are:*128, 256, 512, 1024, 2048, 4096, 8192, and 16384*

Usually the sampling interval is determined by other factors than the record length. Thus, the record length is usually varied by changing the number of samples to record. However, if the number of samples available cannot give a suitable record length you may have to change the sampling interval.

Table 5.2   *Record sizes with different number of samples and number of channels.*

No of samples	No of channels				
	1	12	24	48	96
128	0.5	6.0	12.0	24.0	48.0
256	1.0	12.0	24.0	48.0	96.0
512	2.0	24.0	48.0	96.0	192.0
1024	4.0	48.0	96.0	192.0	384.0
2048	8.0	96.0	192.0	384.0	768.0
4096	16.0	192.0	384.0	768.0	1,536.0
8192	32.0	384.0	768.0	1,536.0	3,072.0
16384	64.0	768.0	1,536.0	3,072.0	6,144.0

SEG-2 standard overhead (approximate)					
Add	2.8	6.5	10.6	18.9	35.4

Oversampling

This feature is used to improve the signal to noise ratio. The trade of is a slightly longer data acquisition cycle time. When oversampling is turned on, data are sampled at a shorter sampling interval, filtered, and then resampled at the selected sampling interval.

For example: You have set TERRALOC to record 2048 samples at 100 µs intervals. With oversampling, TERRALOC would actually record 16384 samples at 25 µs intervals. Befor e adding data to the stack, they will be processed to the pre-set settings.

Number of Stacks

This number shows how many stacks will be made before automatic saving of the data. If you type 0 (zero), stacking will continue until you press <SAVE> key. Even if you type a number higher than 0 (zero) you may always interrupt stacking by pressing the <SAVE> key.

Delay/Pre-trig

Pre-trig allows you to record noise before the shot event, while delay allows you to postpone the actual recording of data until a specified time after the shot event. Prompt is

[Positive value = Delay, negative value = Pre-trig]

Here you set the delay/pre-trig time in milliseconds - from shot trigger pulse reception to start of wave form sampling processing. A negative delay corresponds to pre-trig. For maximum delay and pre-trig times, see table 5.1. Type in the required value. You set pre-trig time similarly in milliseconds. The range is from zero to minus record length in milliseconds.

Table 5.3   *Maximum recording length, pre-trig and delay times.*

Sampling interval (ms)	Max record length (s)	Max pre-trig (s)	Max delay (s)
0.025	0.409	0.409	0.819
0.050	0.819	0.819	3.276
0.100	1.638	1.628	6.553
0.250	4.096	4.096	16.383
0.500	8.192	8.192	32.767
1.000	16.384	16.384	65.534
2.000	32.768	32.768	131.068

*)   Max pre-trig is depending of the selected number of samples to record. It is equal to the length of the record, i.e. 0-100 % of the record length.

**)   Max delay time depends only on the sampling interval.

Stacking Mode

There are four stacking modes to select: *Fast stack, Autostack, Preview, and Stack once*

The selected stacking mode, does not affect the way data are acquired. It determines in what way data are transferred from the acquisition memory to the stack memory and if and what data (stacked or raw waveforms) are displayed.

Fast Stack	Received signals are added to the stack immediately but the wave forms are not displayed on screen. Instead the noise is displayed all the time if the noise monitor is active. This mode gives the highest rate for data collection as no screen up-date takes place. Useful when using a hammer energy source or when you want to monitor ambient noise during a complete recording sequence.
Autostack	In this mode, the recorded signals are automatically added to the stack memory at once. The stack content is then displayed as an enhanced/ averaged/ normalized/ agc:d waveform, as selected by you.
Preview	Received signals are displayed from each shot at a time. This feature does NOT add them automatically to the stack. It gives you the choice of adding them - if the signals are acceptable press <ENT> - or letting them be overwritten (discarded) by the next shot. If a new shot is received before the <ENT> key is pressed, the previous shot is lost.
Stack Once	This mode works exactly like AUTOSTACK with the exception that Terraloc will only accept one addition of signals into the trace stack memory each time the system is armed. This function is used whenever multiple trig pulses may be expected from a noisy or bouncing source.Only the first pulse will start a measurement, any bounce will have no trigger effect.

Re-arm Mode

You have a choice of Manual or Auto re-arm. Use "Auto" when you want TERRALOC to be automatically ready for the next shot after saving and storing a complete record - for example when using short shot intervals in marine reflection surveys. Note that all relevant parameters are updated at save in both Manual and Auto re-arm modes.

When you measure with the automatic rearm feature enabled, the instrument arms in the same moment as saving of data starts. Thus as soon as it is saving data, the instrument is ready for the next shot. There will, however, be no visual evidence of the instruemnt being armed in this case, except for the status message "Saving data ...". The instrument can handle simultaneous saving of the current data set and acquisition of the next data set.

NOTE! There will be no "ARMED!" message to indicate that the instrument is ready to receive a new trig event. In the same moment as the status message "Saving data ..." is displayed, the instrument is also armed.

5.4.3 LAYOUT GEOMETRY

This screen allows you to enter the exact layout geometry in three dimensions - generally along, across and up/down the profile, but also in any other co-ordinate system. You can also select measurement mode (standard, roll-along and optimum offset) and set the reference channel (Figure 5.5).

All parameters related to some co-ordinate system (locations, move-ups etc.) comprise X- Y- and Z- fields. Normally X is distance along and Y is distance perpendicular to the layout, and Z is height above or below the layout.

```
TERRALOC MK6   Ver 2.11          C:\SEISDATA\PROJ 5                    13.4 U
                          ———— LAYOUT GEOMETRY ————
Shot location:          X =     0.00  Y =      0.00  Z =      0.00
Shot move-up:           X =     0.00  Y =      0.00  Z =      0.00
Receiver array move-up: X =     0.00  Y =      0.00  Z =      0.00

                        ———— Receiver Locations ————
Trace  1  Chan.  1:  X=  1500.00  Y=     0.00  Z=      0.00
Trace  2  Chan.  2:  X=  1505.00  Y=     0.00  Z=      0.00
Trace  3  Chan.  3:  X=  1510.00  Y=     0.00  Z=      0.00
Trace  4  Chan.  4:  X=  1515.00  Y=     0.00  Z=      0.00
Trace  5  Chan.  5:  X=  1520.00  Y=     0.00  Z=      0.00
Trace  6  Chan.  6:  X=  1525.00  Y=     0.00  Z=      0.00
Trace  7  Chan.  7:  X=  1530.00  Y=     0.00  Z=      0.00
Trace  8  Chan.  8:  X=  1535.00  Y=     0.00  Z=      0.00

Reference channel:  Off
Reference move-up:    X =     0.00  Y =      0.00  Z =      0.00

Measurement mode:   STANDARD

Roll-along start trace:  1        Source type:   DYNAMITE
Roll-along end trace:    6        Receiver type: VERTICAL_GEOPHONE
Roll-along step:         1        Trace type:    SEISMIC_DATA

                        <Ok>              <Cancel>
Record: 100156   |  Status:
```

Figure 5.5   *The Receiver layout Menu.*

Shot Location

Position of the shot. This value is shown in the header of the information window in the Measure Menu.

Shot Move-up

This parameter is used when updating the shot location between records. The values input to the X-, Y- and Z-fields are added to the components of the location.

Receiver Array Move-up

This parameter is used when updating the receiver locations between records. The values input to the X-, Y- and Z-fields are added to the components of each receiver location.

Receiver Locations

If all channels are not visible scroll with <ARROWS>. Here you should supply the receiver locations. Note that the locations supplied are actually assigned to the traces. Thus if you have changed the channel assignments, check how this might affect the locations. If you press <CTR>+<TAB>, you get access to the Auto Receiver Layout Menu, which can be used to compute the locations for the receivers.

The receiver locations are used to determine the receiver separation for the velocity function in the View Data Menu.

Reference Channel

The reference channel field controls the external connector labelled "REF.CH. 12/24", and it can take one of three values: *Off, 12, and 24*. This means that you can have the connector disabled, or you can redirect either channel 12, or channel 24 to the external connector. If you redirect one of these two channels, it will be disconnected in the corresponding NK-27 connector.

NOTE! If there are more than 24 channels installed in the instrument, the posible values will be: *Off, 24 and 48*.

Usually, it is used for up-hole channel, or to record the source signature when doing vibration seismics. The reference channel input has the same specifications as the conventional channel inputs.

Another application for the reference channel, is if you plan to use only one geophone, e.g. in a borehole. For each shot you disable and enable different traces and thus, build up the whole record. Then, it is convenient to use the reference channel, instead of wire the geophone to two of the pins in a NK-27 connector. In the receiver spread menu, you can assign one channel to all traces, and switch on and off the stack memories for individual traces.

Reference Move-up

If you are using the reference channel, and the location should be updated between records, you enter the distance to move the location here. Note that, you specify the location of the receiver used for the reference channel together with all other receiver locations. It is only the reference move-up that you enter separately, in case the reference channel is kept fixed, or moved individually in relation to the rest of the layout.

Measurement Mode

You can use TERRALOC MK6 in three different measurement modes: *STANDARD, ROLL-ALONG, and OPTIMUM OFFSET*. These modes will be explained below. Remember, that when you enter a new measurement mode and accept this, you will lose all the settings of the receiver spread menu. This is because the current record is reinitalized according to the measurement mode selected.

Standard: In this mode, data are recorded according to the settings. No parameters besides record number and shot/receiver locations are changed between records.

Roll-along: In the roll-along measurement mode, a roll-along switch is emulated by the software. This means that you can perform roll-along measurements with e.g. a standard twenty-four channel layout. The instrument switches the active channels automatically, according to the settings of roll-along start and end trace, and roll-along step.

    Before the first shot of the profile, you set start- and end-trace for the first record. When you arm the instrument, this means that you will only have the channels corresponding to these traces active, all other channels are inactive. After the record has been saved, the start- and end-trace are updated according to the roll-long step parameter. A more thorough explanation of making roll-along measurements is given in section 10.4.2.

Optimum offset: In this mode, you can in a convenient way do optimum offset measurements. When the record is initialized, only the first trace remains active, all other traces are disabled. Data are always recorded on the current trace.

    To move from the first trace when you are satisfied with the data recorded, press **<RIGHT>**. This disarms the instrument and makes the next trace the current trace. You can see that the previous trace contains data by looking at the information window prompt. The active trace is marked by a 'X', an inactive trace by a '-' and a trace containing data is marked by a '$'.

    Pressing **<RIGHT>** when the current trace does not contain any data, displays a question "Skip this trace?", giving you a chance to skip traces that cannot be recorded for some reason.

    If you find that some trace contain bad data, you can select that trace as the current, and clear the contents (by "Clear current trace"). Then you can record data again on that trace.

    For more information about the optimum offset mode, see section 10.4.3.

Roll-along Start Trace

The first active trace of the layout, when using the roll-along measurement mode.

Roll-along End Trace

The last active trace of the layout, when using the roll-along measurement mode.

Roll-along Step

The number of positions, the active part of the layout should be switched, between two consecutive records.

Source Type

The contents of this field is only used as information (in the SEG-2 data file), about the type of source used to acquire the data. Possible values are:

> *UNTITLED*
> *HAMMER*
> *WEIGHT_DROP*
> *GUN*
> *DYNAMITE*
> *VIBRATOR*

Receiver Type

The contents of this field is only used as information (in the SEG-2 data file), about the type of receivers used to acquire the data. Possible values are:

> *UNTITLED,*
> *VERTICAL_GEOPHONE,*
> *SH_HORIZONTAL_GEOPHONE,*
> *SV_HORIZONTAL_GEOPHONE*
> *ACCELEROMETER.*

Trace Type

The contents of this field is only used as information (in the SEG-2 data file), about the type of data acquired. Possible values are:

> *UNTITLED*
> *SEISMIC_DATA*
> *DEAD*
> *TEST_DATA*
> *UPHOLE.*

If, for some reason, there are no data in a trace when saving, the trace type parameter will be set do *DEAD* automatically.

5.4.4 ANALOG FILTERS

The analog filters dialogue box allows you to set cut-off frequency values and slopes for the analog highpass filter, as well as switching on and off the notch filter.

Signals usually contain noise from sources such as wind and traffic. This noise has often low frequency. Analog filter removes these frequencies from the signals. However, the filter may also deteriorate original signals. The higher the cut-off frequency and filter damping, the worse possible distortions. Using an analog filter is always a compromise.

If the noise is high, record it. Use the spectrum function in the View Data menu to analyze it, and to see the actual noise frequency. Thereafter select and use an appropriate analog filter.

If noise is not high, do not use the analog filters.

Note that the anti-alias filter - used to prevent distortion of the sampled signal waveform by removing frequencies above the Nyqvist frequency (half the sampling frequency) - is set automatically in TERRALOC according to the selected sampling frequency.

Analog filters affect all channels. Note that you will not be able to recover any incoming signals that are filtered out. Use analog filters only to remove low frequency ground roll. Generally, be cautious about using the these filters as there is always a risk that they may eliminate valuable signal information.

Figure 5.6   The Analog Filters Menu

Highpass Filter

The highpass filter can be either On, or Off. Slope and cutoff frequency specifiy the filter when it is On.

Filter Slope

When choosing filter slope, remember that generally 24 dB/octave filters distort more than 12 dB/octave, but also damp noise more effectively. Use as low a cut-off frequency as possible - generally twice the maximum noise frequency. A good rule is to start with the 12 dB/octave filter. If the recorded signal is acceptable then keep the filter, otherwise try again with the 24 dB/octave filter.

Cut-off Frequency

You have 16 different cut-off frequencies for each filter slope to choose from

12 dB/octave:	12	24 dB/octave:	15
	24		30
	36		45
	48		60
	60		75
	72		90
	84		105
	96		120
	108		135
	120		160
	132		175
	144		190
	156		205
	168		220
	180		225
	192		240

Notch Filter

Use this when working in vicinity of power lines, otherwise leave it off. A spectrum analysis of a noise recording may often show if power line noise is present.

Note! The notch filter is set to 50 Hz, unless 60 Hz was specified in your order. Changing from 50 Hz to 60 Hz is by adjusting a hardware strap on a circuit board, followed by filter calibration. Should you need to re-strap your notch filter, please ask ABEM for calibration procedure.

5.4.5 TEXT

The contents of the fields in this Text Information Menu are stored in the data files, but are used for information only. You do not have to fill in these fields. For more information on how the text strings are stored in the SEG-2 files, please refer to the SEG-2 manual, "Seismic (/Radar) Files in Personal Computers Standard", SEG (1990), included in the documentation kit for your TERRALOC.

If you are using the TERRALOC keyboards you can only type numerical codes. To be able to type alpha numerical strings, you must have an external AT-keyboard connected.

Client

Name of company or organization sponsoring data acquisition and processing.

Company

This is the name of the company responsible for acquiring and/or processing the data.

Job ID

An identification for this particular job.

Observer

The name of the individual responsible for data acquisition.

Notes

This is a small text editor. Here you can write down any notes you may have regarding the data acquisition etc. The maximum number of characters that you can enter is 2000 (spaces, tabs and new-lines included).

5.5 SET TRIG

This menu allows you to set the trigger as well as arm input and output options. The pop-up menu is divided into input and output selections.

<1> Arm/Trig input   Select trig input type and sensitivity as well as type of external arm input.
<2> Arm/Trig output   Select arm and trig output type.

5.5.1 ARM/TRIG INPUT

Select trig input

Analog

Select Analog when you use a standard trigger geophone or a trigger coil. If you use analog trigging, you should check and/or set the analog trig sensitivity.

Switch

Select Switch when you use a make or break trigger circuit - for example when trigger cable leads are shorted together (make switch) by the explosion compressing and shorting a pair of twisted insulated wires inserted in the dynamite. Or when the explosive cuts the trig wire connection (break switch) that has been wound a few turns around the charge. Set Trig Sensitivity to a low value to avoid inadvertent triggering by spurious signals.

Active High

This choice uses the "TTL Arm/Trig" connector. Triggers when trigger input signal is set to "1" (high).

Active Low   This choice uses the "TTL Arm/Trig" connector. Triggers when trigger input signal is set to "0" (low).
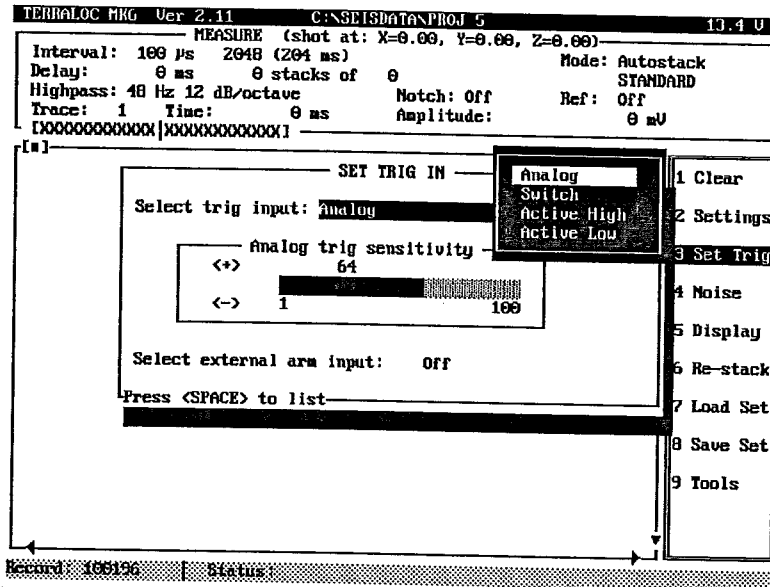

Figure 5.7   *The Trig Input Menu.*

Analog trig sensitivity

The analog trig sensitivity is active only when you are in analog or switch trig modes. When you increase trig sensitivity, a weaker signal will trigger the TERRALOC MK6. If you decrease Trig sensitivity, then triggering needs a large signal. Sensitivity level needs to be high enough to ensure triggering by the trig signal, but not so high that spurious signals will trigger in advance of the actual shot impulse. For example, when a geophone is used as the source of the trig signal, a time delay will always be present between the shot instant and the trig time. There are two main causes for this:

1.   The propagation delay from the shot point to the geophone.

2.   The rise time of the geophone output signal to the trig level.

Figure 5.8 illustrates the relationship between trig sensitivity and the rise time of the receiver output signal to the trig level.

To reduce the propagation delay, the only way is to move the geophone closer to the shotpoint. This can not always be done, due to physical limitations in which case you will have to accept the delay.

The rise effect, is another matter, because it is influenced by a number of conflicting requirements. If the trig sensitivity is increased, the result is of course an earlier trig event, but increasing the sensitivity also means that the risk of trigging the system by a noise signal increases. If the sensitivity is too low, noise triggering will not occur, but instead a considerable and poorly defined delay is introduced. This can seriously degrade the performance of the stacking of signals, since any signal with a period time comparable to, or less than this trig uncertainty, will be attenuated. So in conclusion, you will have to find a
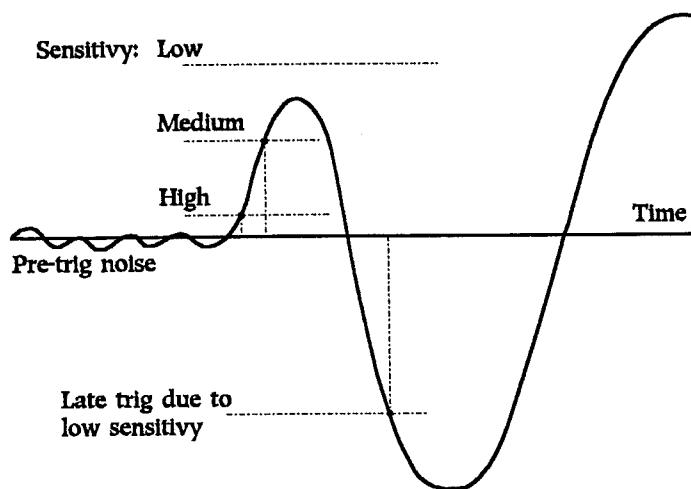
Figure 5.8   *Trig signal from a geophone and the trig event.*

suitable compromise between high sensitivity to false triggings and large timing errors.

To increase or decrease trig level, press <+> or <->. You may select any value from 1 - 100. If you hold <+> or <-> key down, then rate of increase or decrease accelerates.

Trig level is displayed both graphically and numerically.

In order to make the setting of the trig sensitivity easier, you receive a trig message

[* * * * * Trigged * * * * *]

whenever a trig signal is received. The status of the trig circuit is reset when you change the sensitivity or press <SPACE>.

Select external arm input

Off   The instrument does not monitor the external arm input, i.e. it is armed from the keyboard only.

Active High   Arms when input signal goes from 0 to 1.

Active Low   Arms when input signal goes from 1 to 0.

External arm is used when interconnecting two or more TERRALOCs. There is no limit for how many TERRALOCs may be connected in this way. When external arm input is selected (either active high or active low), the TERRALOC monitors the input continuously and if the signal goes high (or low) the TERRALOC will arm.

5.5.2 ARM/TRIG OUTPUT

Use this to inform other electronic devices - other seismographs, vibrators, computers, etc - that TERRALOC has triggered. The signal is in TTL standard.

Select trig output

Active High

Active Low

The trig output indicates the current trig state of the TERRALOC to an external device. Active high means that TERRALOC outputs a positive pulse when trigged. Active low means that it outputs a negative pulse when trigged. The pulse width is approximately 20 ms.

Select arm output

Active High

Active Low

The arm output indicates the current arm state of the TERRALOC to an external device. Active high means that if the TERRALOC is in the armed state, it will output a "1". Active low means that it outputs "0" when armed.

Note! If you have several instruments or devices connected in a "daisy chain", you must ensure that both Arm Input and Arm Output are properly defined on each instrument (i.e. they must all be set to either Active High or Active Low).

5.6 NOISE

There is a real-time noise monitor integrated in the system. It can be used to just inspect the noise level, or monitor the noise so the operator is able to fire the shot at the right moment.

Figure 5.9 *Noise monitor menu.*

Noise monitoring

Press <SPACE> to toggle noise monitoring *ON* or *OFF*. if you select ON, then Noise Monitor screen appears when you arm TERRALOC MK6.

The noise monitor screen shows the instantaneous signal levels in all active channels as horizontal lines. Inactive channels show OFF on the channel number axis. The horizontal bars length is proportional to voltage level at amplifier output. Peak values are shown momentarily as black blips. To measure an actual noise level, press <+> or <-> keys to move a vertical dashed marker line to the desired level; actual dB value for that level in relation to maximum input shows above the line.

Mode

Press <SPACE> to toggle between:

Amplitude / Full wave-form

If you choose waveform, the "waterfall" like waveforms are shown in the noise monitor window.

Monitor damping

If noise signals on the monitor extend to and beyond the right edge of the screen, you should adjust the noise monitor scale (monitor damping) by one of the available values: *0, 12, 24, 36, and 48 decibels.*

Note! This value does not affect the noise levels in any way. It is just used to scale the displayed value on the screen.

<MONITOR>

This command activates the noise monitor. It can be used if you want to check that all channels are connected correctly and alive etc. It does not matter whether the noise monitor status is On or Off. The noise monitor is closed by pressing <ESC>.

Geophone check

When the noise monitor is activated as described above, you can press <SPACE>, for a simple geophone check. Starting the geophone check sends a current through the geophones for a little while, then the current is stopped. You can see how the geophones respond to this. If any geophone is not connected, the corresponding trace will be dead, besides the background noise. In addition to this there is a more extensive geophone test under TOOLS.

5.7 DISPLAY

Set the view options for plotting data. This is the only command that can be executed when the TERRALOC is armed.

5.8 RE-STACK

Use this to read in previously saved data that you wish to use for further measurements. A status window "Reading data" shows. The screen will show the traces when all data is read. When you press <ARM>, this alert message shows

> Do you want to continue stacking on this record?
> <YES> <NO>

If you choose YES, the TERRALOC arms and continues stacking on the current data, otherwise the data are discarded and stacking starts on an empty stack. Current data is the data you read from the data file.

In order to protect the data in the previously saved file when continuing to stack data, the filename of the re-stacked record will be the current record number. If you want to save the data on the same file, you should have Auto save set to No. Then you will be asked for a filename (current record number as default) and can type in a desired filename.

5.9 LOAD SET

Select a MK6 settings file from a list of files on the current working directory. The format of a MK6 settings file can be found in Appendix C. It allows you to set up your TERRALOC quickly by loading a pre-determined configuration.

If the TERRALOC can not read the selected file, the you will get the following error message

> ERROR!!!
> Settings file 000003.MK6 is corrupt!

If the file corrupt message shows, TERRALOC will automatically select the default settings.

5.10 SAVE SET

Select this to save your settings - sampling parameters, geophone set-up, filters etc - on a file. This is a formatted ASCII text file with extension ".MK6". Default settings file name is current record number or if it is not available 000000.MK6. Edit the filename field to a unique name - maximum eight characters. The extension is set automatically. If a file with the desired name already exists, the TERRALOC will warn you

> File already exists! Overwrite?

<YES>   <NO>

<Yes> overwrites the old file with the contents of the new. <No> returns to the filename input menu.

5.11 TOOLS

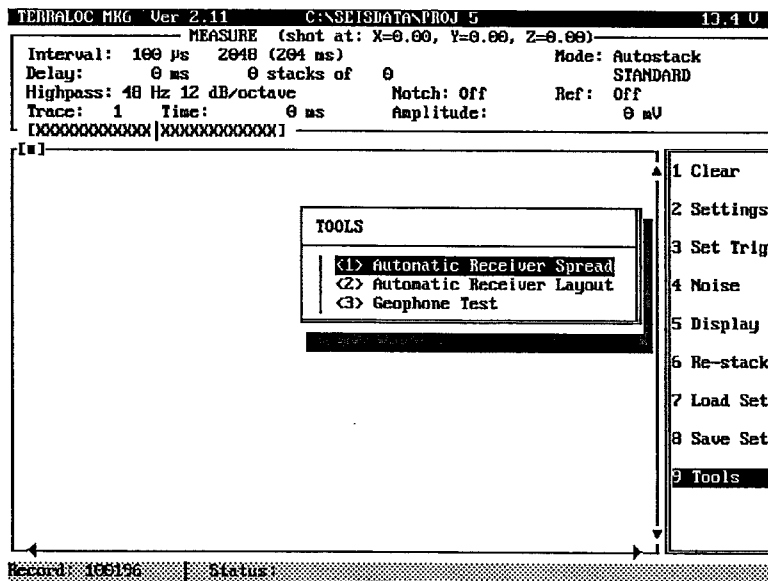Under TOOLS you will find a variety of useful functions.

```
TERRALOC MK6  Ver 2.11        C:\SEISDATA\PROJ 5                13.4 U
—————— MEASURE  (shot at: X=0.00, Y=0.00, Z=0.00)——————
Interval:  100 µs   2048 (204 ms)              Mode: Autostack
Delay:      0 ms      0 stacks of  0                 STANDARD
Highpass: 48 Hz 12 dB/octave        Notch: Off   Ref: Off
Trace:   1    Time:      0 ms       Amplitude:        0 mU
[XXXXXXXXXXXX|XXXXXXXXXXXX]
[m]
                                                          1 Clear
                                                          2 Settings
                      TOOLS                                3 Set Trig
                      <1> Automatic Receiver Spread        4 Noise
                      <2> Automatic Receiver Layout        5 Display
                      <3> Geophone Test                    6 Re-stack
                                                          7 Load Set
                                                          8 Save Set
                                                          9 Tools

Record: 100196    Status:
```

Figure 5.10   *Tools menu. A number of useful tools.*

5.11.1 AUTOMATIC RECEIVER LAYOUT

This menu can also be accessed from the Receiver Layout Menu by pressing **<CTR>+<TAB>**.

There are only two rows of fields active at each moment. You may edit the values of these fields and when you move to another field or press <OK>, the values of the disabled fields will be calculated automatically. Thus this menu can be used for rapid setting of receiver locations.

If you want to disable another row of fields, just go to one of the fields in that row and press **<SPACE>**.

Layout Start   The X-, Y- and Z-coordinates of the receiver for trace no. 1 of the
                      receiver layout.

Layout End   The X-, Y- and Z-coordinates of the receiver for the last trace of
                      the receiver layout.

Receiver Separation   The X-, Y- and Z-distances between adjacent receivers.

```
█TERRALOC MK6  Ver 2.11        C:\SEISDATA\PROJ 5              13.4 V
                        ──── LAYOUT GEOMETRY ────
Shot location:           X = █     0.00  Y =    0.00  Z =     0.00
Shot move-up:            X =      0.00  Y =    0.00  Z =     0.00
Receiver array move-up:  X =      0.00  Y =    0.00  Z =     0.00

              ──────── Receiver Locations ────────
│Trace  1  Chan.   1:  X=      0.00  Y=    0.00  Z=      0.00  │
                   ──── AUTOMATIC RECEIVER LAYOUT ────

  Units: [m]

  Layout start (Trace  1):  X=    1500.00   Y=      0.00  Z=      0.00
  Layout end   (Trace 24):  X=    1615.00   Y=      0.00  Z=      0.00
  Receiver separation:     ΔX=       5.00  ΔY=      0.00  ΔZ=      0.00

                        █OK█      <Cancel>


 █
Roll-along start trace:   1       Source type:   UNTITLED
Roll-along end trace:     6       Receiver type: UNTITLED
Roll-along step:          1       Trace type:    UNTITLED

                  <Ok>                      <Cancel>

█Record  100196   │ Status:
```

Figure 5.11   *Automatic receiver layout menu. Entry form for receiver locations.*

This is one of the few menus, where pressing <ENT> in any field does not work as <Ok>. When you press <ENT> in any field, the entered value is validated and all other fields updated. <ESC>, however, works as if <Cancel> was selected.

5.11.2 AUTOMATIC RECEIVER SPREAD

This menu can also be accessed from the Receiver Spread Menu by pressing <CTR>+<TAB>.

In this menu you can change the channel assignments in an easy and quick way. It is assumed that you are using cables corresponding to the value of "Takeouts per cable", and that the number of active channels is a multiple of this value. All cables must have the same number of takeouts if you are going to use this menu.

Number Of Active Channels	This is the number of channels that will record data. This value is set in the System Setup Menu.
Number Of Takeouts Per Cable	The number of takeouts on the cables used. All cables should be similar in this respect. This value is set in the System Setup Menu.
Cable Orientation	The cable orientation shows each cable and how it is oriented, i.e. forwards or backwards..
Traces	Shows the trace numbers. The traces are grouped according to the number of takeouts per cable.

Channels   Shows the channels of each cable and what traces they
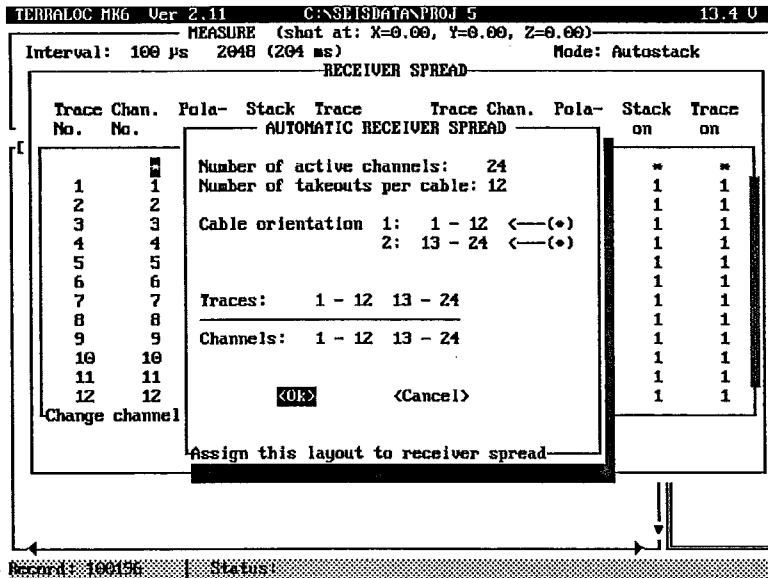   correspond to.

Figure 5.12   *Automatic receiver spread menu. Assign channels to traces according to seismic cables used.*

A layout is defined by its total number of channels and the number of takeouts on the cables. All layouts activated in this menu are saved on disk. The filename mask is CBnn$m.SPD, where CB=CaBle, nn=number of active channels, m=number of cables and SPD=spread. the $-sign is only a separator. The current order of the cables is also saved in each of these files.

5.11.3 GEOPHONE TEST

This geophone test is more extensive than the geophone check available in the noise monitor. It can be found under the "9 Tools" command, as item number three. This test, records the response from the geophones to an impulse signal. A DC-current is sent to the geophones dislocating the seismic mass of the geophone. When thte DC-current is switched off, the mass performs a damped oscillation with its resonance frequency while it comes to rest. Thus, you will get a report on the maximum amplitude of the response, resonance frequency and damping.

The program makes an analysis of the recorded test data and tries to determine the status of each channel.

If one or more parameter differs from the mean of all channels, there will be a warning displayed beside that parameter, eg. you have one 10-Hz geophone among twenty-three 30-Hz geophones.

After the analysis of the data has been performed, a report will be generated and stored on disk (see page D-1). The current record number is used to create the filename. The filename pattern is: GTxxxxxx.RPT, where GT=Geophone Test, xxxxxx=rec. no. and RPT=report. You can also, if desired, save the the complete set of recorded test signals on disk, in a SEG-2 file format (it is an ordinary datafile).

5.12 DATA ACQUISITION

When you press <ARM>, the recording of data starts. Data are continuously recorded and stored in the acquistion memory in a circular manner. The trig event starts a counter that counts the selected number of samples (i.e. number of samples selected minus number of samples for pre-trig). Then the sampling stops and the acquired data are transferred to the trace memory.

The number of channels used to record data, is equal to the number of channels installed (as set in the System Definition Menu). For example, let us assume that you have twenty-four channels installed and have set the number of active channels to twelve. Then data will be recorded on all twenty-four channels, but only twelve of these will actually be used.

Normally, the data are added to the contents of the trace memory, but in the case of preview mode, data are just copied, not added. In preview mode, only if you press <ENT>, data are added to the contents of the preview stack.

After the data have been transferred to the trace memory, data are scaled and displayed on screen (depending on stacking mode).

5.13 SAVING DATA

Data can be saved to disk in two ways. Either automatically when the set number of stacks in the Sampling Parameters Menu is reached, or you can press <SAVE>. If the number of stacks has been set to greater than or equal to 1, data are saved automatically when that number of shots has been added to the stack.

Record log file

In the C:\MK6\SYS directory there is file called RECORD.LOG. This file is a ASCII text file that contains a log of all records saved since the first startup of the system. Each line comprises the filename of the record, the directory the record was saved on, and the date and time the record was saved. Even data saved, due to a program crash, are logged in this file.

As this file grows in size as more records are saved, it should be regurarly deleted. It can be a good idea to make a backup copy of the file to a floppy disk, before deleting it.

5.14 DATA SAFETY

To enhance the safety of the system and the data acquired, there are a few measures to mention. These functions are performed automatically by the system.

The system parameters are saved regularly with an interval of a few minutes. They are also saved when you save data by pressing <SAVE>.

In case of a software crash, acquired or proceesed data still in memory are saved to a rescue file. These files are named ERRxx.SG2, where xx = a number form 00 to 99. Thus, you may have up to one hundred rescue files on one directory. The files are numbered sequentially.

Chapter 6

6 VIEW MENU

- Data	View data stored on disk, frequency analysis, first arrivals, digital filtering.
- Geophone Test	View reports generated by the geophone test.
- Text Files	View ASCII text files.
- Options	Set options for the view data menu (can be set from inside View Data also).

6.1 VIEW DATA

6.1.1 THE VIEW DATA MENU SCREENS

The centre of the screen has three sections, see Figure 6.1. The top window is the information window, the window on the right is the command window and the largest one is the data window.

6.1.2 INFORMATION WINDOW

This window contains, as its name implies, information about the current record which is displayed on the screen; display option settings and time and sample values etc.

File: The current record (filename) that is loaded in memory.

Mode: The mode used to display the current record including scale factors, AGC window etc.

Gain: The individual gain for the current trace. If individual scaling of traces (page 6-21) is off, this field is empty.

Trace: The current trace (also marked by a trace marker in the trace window).

Time: The time corresponding to the current position of the time line.

Relative time: In the zoom mode (single trace display), you can anchor the time line at any time. This field displays the time difference between the anchor and the current position of the time line.

Inverse time: The reciprocal value of the relative time. The unit is s^{-1}. This corresponds to frequency (Hz or cycles/s). See page 6-4.

Amplitude: Current trace amplitude (signal value) at the time line position. The units used are defined in the system setup menu (page 8-1), and can be: none (A/D converter data), mV (input signal), or cm/s (particle velocity at the geophone).

6.1.3 TRACE WINDOW

In the trace window, all data are displayed in graphical form. There are three modes of display: all traces, single trace (or zoom), and spectrum.
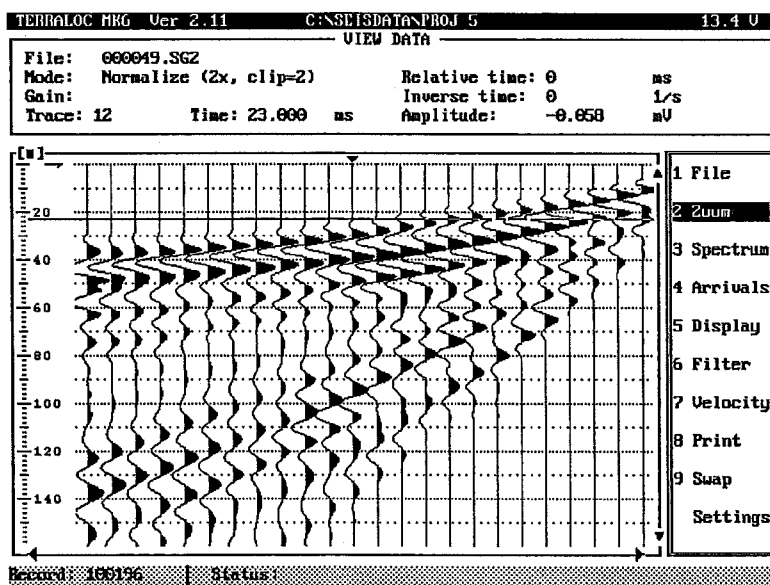
Figure 6.1   *The view data menu.*

6.1.4 COMMAND WINDOW

The command window is comprised of ten command buttons, each (except the last one, no. 10) preceded by a quick access number. Use <TAB> and <SHIFT> + <TAB> to move between the buttons, or press the number corresponding to the desired command. Commands that are meaningless for the current view mode are disabled and greyed out. For example, when you are viewing the spectrum of a trace, there is no meaning to pick first arrival or do a velocity analysis and the corresponding commands are disabled.

6.2 VIEW DATA COMMANDS

6.2.1 FILE

Opens a sub-menu for reading and saving of data.

Read data from file

You will get a list of files to select from (Figure 6.2). If needed, you may change the file specification to list files according to different name patterns. If there is a record in the memory that has been processed, e.g. filtered, a warning is issued. Then, you can save the record to disk, discard it or cancel the reading of a new record. It is also possible to change the current working directory.

```
TERRALOC MK6   Ver 2.11        C:\SEISDATA\PROJ_5                    13.4 U
┌──────────────────────── VIEW DATA ────────────────────────┐
│ File:                                                      │
│ Mode:   AGC (40 ┌──────────────READ DATA───────────┐   ms  │
│ Gain:           │ Filespec: *.SG2                   │   1/s │
│ Trace:   1      │                                   │   mU  │
│                 │ Filename:                  <Ok>   │       │
│ ┌[■]─────────── │ Directory:C:\SEISDATA\PROJ_5 <Cancel>   ┌─┴────────┐
│ │               │                                   │▲│ 1 File   │
│ │               │ ┌─ Files ──┐  ┌ Directories ┐     │ │          │
│ │               │ │ 000001.SG2│  │ .           │     │ │ 2 Zoom   │
│ │ ŞÁâ ÞÞ88 â    │ │ 000002.SG2│  │ ::          │     │ │          │
│ │               │ │ 000003.SG2│  │ [-A-]       │     │ │ 3 Spectrum│
│ │               │ │ 000004.SG2│  │ [-C-]       │     │ │          │
│ │               │ │ 000005.SG2│  │             │     │ │ 4 Arrivals│
│ │               │ │ 000006.SG2│  │             │     │ │          │
│ │               │ │ 000007.SG2│  │             │     │ │ 5 Display│
│ │               │ │ 000008.SG2│  │             │     │ │          │
│ │               │ │ 000009.SG2│  │             │     │ │ 6 Filter │
│ │               │ │ 000010.SG2│▼ │             │     │ │          │
│ │               │ └Press <SPACE> to list or type┘     │ │ 7 Velocity│
│ │               └───────────────────────────────┘     │ │          │
│ │                                                      │ │ 8 Print  │
│ │                                                      │ │          │
│ │                                                      │ │ 9 Swap   │
│ │                                                      │ │          │
│ │                                                      │▼│ Settings │
│ └──────────────                                       └─┴────────┘
│ Record: 100196  │ Status:                                   │
└────────────────────────────────────────────────────────────┘
```

Figure 6.2   *Get a file from disk.*

The SEG-2 file standard defines the first two bytes of a file as an unsigned integer, with the constant hexadecimal value 3A55h. This is used when listing the files in the current directory. It does not matter whether the user selects to list files according to the pattern *.*, or *.SG2. The program reads all files that match the selected pattern, and then filters each file, i.e. tests to see if the first two bytes equal 3A55h. This value also works as an identification for the byte order in the file, i.e. the way the bytes are numbered in a word or longword (a word usually consists of two bytes, and a longword of four bytes). TERRALOC MK6 cannot read SEG-2 files created by systems using another byte order than PC/AT-compatibles and MS-DOS.

Save data to file

First, a filename is created, using the filename of the current record. If data has been processed, e.g. filtered, this name is prefixed by the string "P_" (Figure 6.3). The filename extension is fixed (.SG2).

If there already exists a file with the identical name as the current record, a warning message is issued, and you will be asked if you want to overwrite this file.

6.2.2 ZOOM

Zooms the current trace and displays it horizontally (see Figure 6.4). Though the trace is displayed, oriented in another direction compared to when all traces are displayed, the keys used for scrolling are the same, i.e. <UP> and <DOWN> scrolls the traces, while <LEFT> and <RIGHT> select current trace. Select <Zoom> again to return to display of all traces, or <Spectrum> to see the amplitude spectrum of the current trace.

In the zoom mode, it is not possible to use the velocity function.

This mode can be recommended when you are going to manually pick, check and adjust first arrivals. Because the resolution of signal strength is much better in this mode, than when all
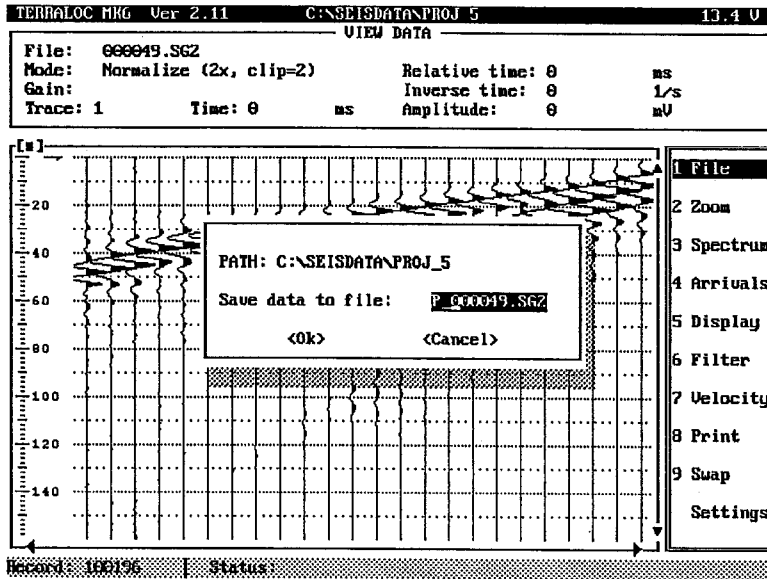
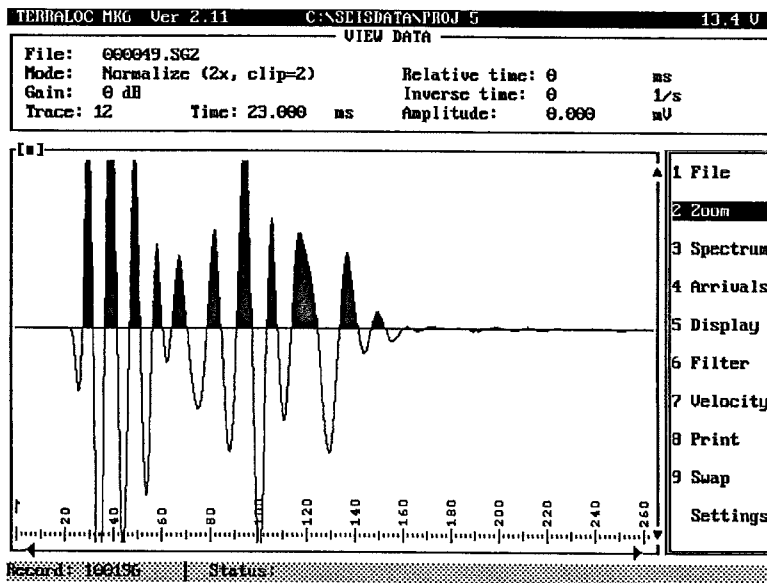*Figure 6.3*   Saving a processed record to disk.

Figure 6.4   The zoom function.

traces are displayed.

RELATIVE TIME

In the zoom mode, it is possible to measure relative time. To do this, move the time line to a desired position, press <0> to anchor a timebase. This timebase is marked by a dashed line. Now, when the time line is moved, the time relative to the timebase is displayed in the "Relative time" field in the Information Window. The "Inverse time" field, is really the reciprocal value of the relative time. In other words, its unit is s^{-1} (i.e. cycles per second, Hz). See Figure 6.5.

Thus, the relative time, works as an easy way of measuring periodic features (and the corresponding "frequency") in the signals.
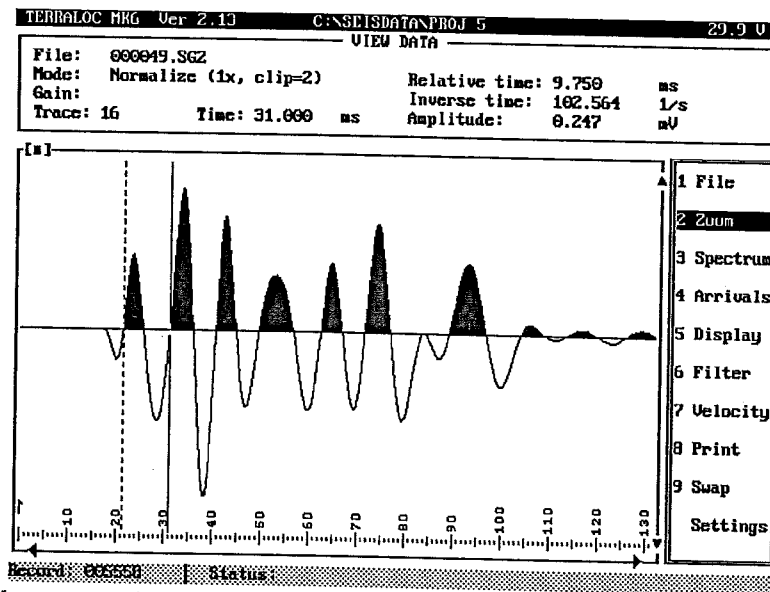
Figure 6.5   *Measuring relative time.*

Pressing <0> again, exits the relative time measurements and removes the timebase.

6.2.3 SPECTRUM

Displays the frequency spectrum of the current trace (see Figure 6.6). In the spectrum (frequency domain) mode, you can select current trace with the <LEFT> and <RIGHT> keys. <SHIFT> + <LEFT> selects the first trace, and <SHIFT> + <RIGHT> selects the last trace. Select <Spectrum> again to return to display of all traces, or <Zoom> to display the current trace in time domain.

It is not possible to use neither the velocity function, nor the first arrivals functions.

The data are windowed by a hamming function, before calculating the spectrum which is done by a pure fourier transform.

You can only change the value of the highest frequency to display, and the amplitude range related to the maximum amplitude in the signal.

The spectrum can be used to estimate cutoff frequencies for the digital filters. It can also be used to anaölyse ground noise for optimal settings of the analog highpass and notch filters.

In cases of bad data recordings, it can be useful to inspect the spectrum to track down possible sources of noise. For example, if you have a large periodic signal that completely hides the true signal, a breif study of the spectrum analysis may then reveal that you have a peak at 50 Hz. Thus, the source of the periodic signal is probably a power line. It could then be worth trying to record with the notch filter enabled, or try to do some digital filtering afterwards.
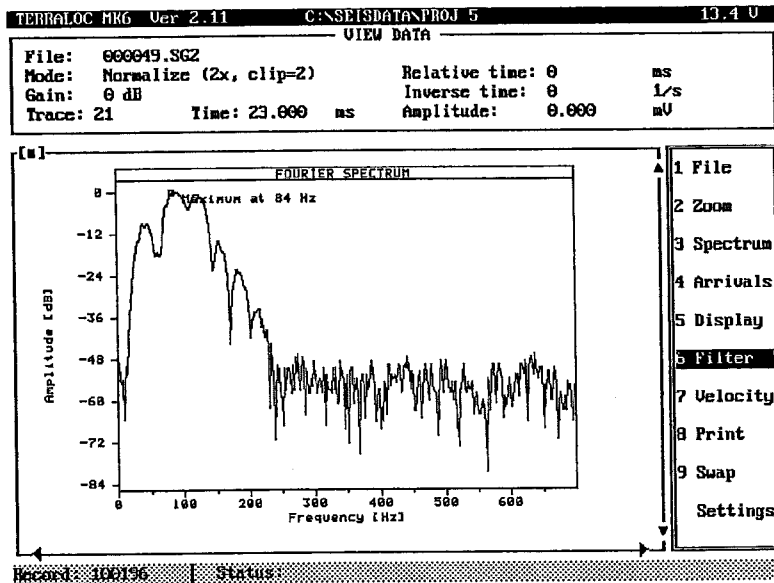
Figure 6.6   *The spectrum display.*

The spectrum also gives an idea about the signal to noise ratio in the recorded signal.

Select <3 Spectrum> once more to return to display of all traces, or <2 Zoom> to get the time series display of the current trace.

6.2.4 ARRIVALS

First arrival times can be picked either automatically, or manually from the data. Already existing first arrivals, can easily be edited. You can also, save to disk, read from disk and clear first arrivals from memory.

To pick or edit first arrivals, just select current trace and move the time line to the correct position and press <·>. If there is an old first arrival, it will be deleted and replaced by a new one. First arrivals are marked by small dashed lines. First arrivals can be edited in both all traces mode and zoom mode. You will not be warned if an old pick exists when setting or editing first arrivals.

The time accuracy of the picked first arrivals, depends on the time scale used to display the data and the display mode. For example, if you have a record sampled at 100 µs that is displayed with 1 sample per pixel, the picks can be set with 100 µs intervals. But, if you are using 8 samples per pixel, picks can only be set with 800 µs intervals. The automatic picking routine, however, always uses maximum resolution, i.e. the actual sampling interval.

It is even more important to select an appropriate display mode to accurately pick the true first arrivals. The way data are displayed should be governed by how well the true first arrivals can be identifed, and not how nice the data look on the screen. Try out different settings of display mode and the respective display mode's parameters.

Auto Time Pick

Automatic computing of first arrivals works best on data with small pre-signal noise. You should always check the picked arrivals and edit any bad picks. If there is one or more picks for this record, you will be warned before times are picked automatically.
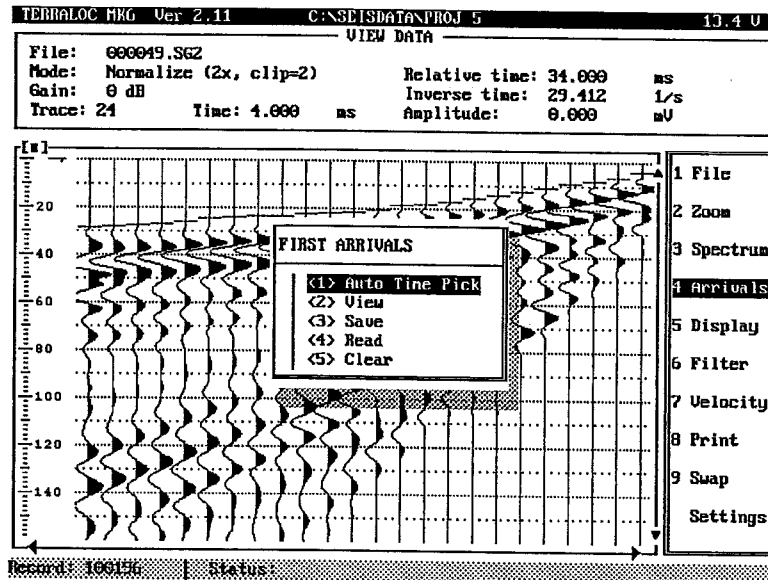
Figure 6.7 *First arrivals menu.*

View

Lists the first arrivals for the current record on screen. This gives the numerical values for the first arrivals in milliseconds.

Save

Saves the first arrivals for the current record on the disk. By default the file is given the same filename as the current record, but with extension "*.FIR". For a description of the file format see section B.2. By editing the default filename, you can save several different sets of first arrivals by selecting unique filenames for each set.

Read

Reads first arrivals from a selected file to the current record. If a first arrivals file is found with a filename corresponding to a datafile, the first arrivals are automatically read and displayed when the data are loaded. After reading the first arrivals, data is rescaled and the picks are included in the data on the screen.

Clear

Clears all first arrivals for the current record, i.e. all first arrivals are set to zero. Answer <Yes> to the question if you want to clear all first arrivals.

6.2.5 DISPLAY

Set the display options for displaying data on screen and on printer. For more details, please refer to section 6.4, page 6-15. Depending on the current display mode, only a specific set of options can be set. For example, if you are in the spectrum mode, you can only set the amplitude range and max frequency value.

If any value is changed in the display options menu, the data is rescaled and redrawn on the screen. The view options are also used to scale data when printing.

6.2.6 FILTER

The TERRALOC MK6 software is not meant to be used as a replacement for dedicated seismic processing, interpretation and modelling software. However, there is always a need to be able to do some digital filtering. This is also possible on TERRALOC MK6. When you select FILTER, you get a sub-menu that comprises all available digital filters. A description of these filters follows below.
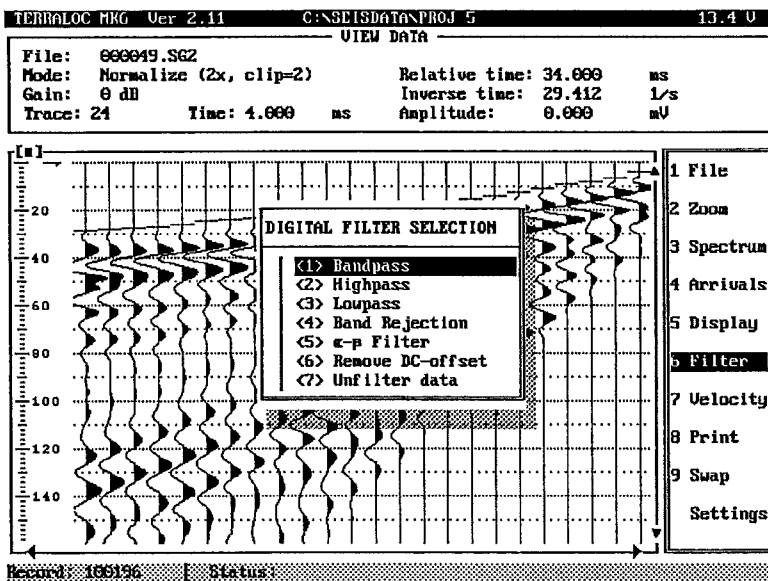
Figure 6.8   *Digital filter selection.*

Unless otherwise stated, the filters are defined in the frequency domain.

If a record has been filtered once, the original data is automatically loaded before doing the next filter pass. Thus, if you want to apply more than one filter operation to a data set, you have to filter the data, save it to disk, and reload it. Then you can filter already filtered data.

Bandpass

This is a Butterworth type of filter. It will reject frequencies lower than the lowcut frequency and higher than the highcut frequency. The highcut frequency must be higher than the lowcut frequency.

```
TERRALOC MK6   Ver 2.11        C:\SEISDATA\PROJ 5                    13.4 U
                         ─ UIEW DATA ─
File:   000049.SG2
Mode:   Normalize (2x, clip=2)        Relative time: 34.000   ms
Gain:   0 dB                          Inverse time:  29.412   1/s
Trace:  24        Time: 4.000   ms    Amplitude:     0.000    mU
```
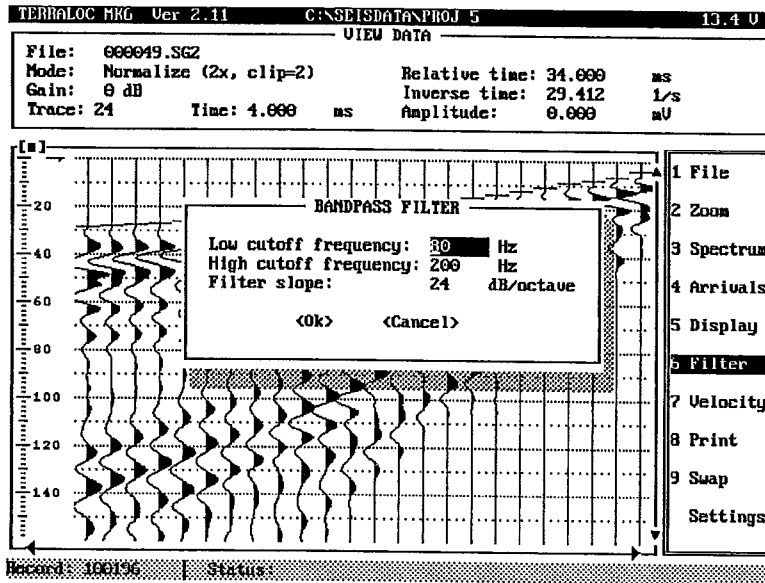
Figure 6.9   *Digital bandpass filter menu.*

Lowcut frequency

Highcut frequency

Filter slope

Sets the slope of the filter. Available slopes are: *6, 12, 18, 24, 30, 36, 42, 48, 54, and 60* dB/octave.

Highpass

This is a Butterworth type of filter. It rejects all frequencies in the signal that are lower than the lowcut frequency.

Lowcut frequency

Filter slope

Sets the slope of the filter. Available slopes are: *6, 12, 18, 24, 30, 36, 42, 48, 54, and 60* dB/octave.

Lowpass

This is a Butterworth type of filter. It rejects all frequencies in the signal that are higher than the highcut frequency.

Highcut frequency

Filter slope

Sets the slope of the filter. Available slopes are: *6, 12, 18, 24, 30, 36, 42, 48, 54, and 60* dB/octave.

Band Reject

This is a Butterworth type of filter. It rejects frequencies that are between the lowcut and highcut frequencies. The lowcut frequency must be lower than the highcut frequency.

Lowcut frequency

Highcut frequency

Filter slope

Sets the slope of the filter. Available slopes are: *6, 12, 18, 24, 30, 36, 42, 48, 54, and 60* dB/octave.

α-β Filter

This is a smoothing filter, intended to remove noise from the signal.

The α-β filter was derived from the Kalman filter. The Kalman is a so-called optimal filter. It performs better than any other linear filter, under specific conditions. The α-β filter resembles the Kalman filter in its nature, structure, and performance, but without the complexity of the Kalman filter. Thus, the α-β filter is called a suboptimal filter. Penoyer (1993) gives a more comprehensive explanation. This filter works in the time domain. Mathematically the filter can be described like this:

$$S_{pn} = \ddot{s}_{n-1} + \ddot{u}_{n-1} \qquad (6.1)$$

$$e_{mn} = s_{mn} - s_{pn} \qquad (6.2)$$

$$\ddot{s}_n = s_{pn} + \alpha e_{mn} \qquad (6.3)$$

```
TERRALOC MKG   Ver 2.11        C:\SEISDATA\PROJ 5              13.4 V
                        ─── VIEW DATA ───
 File:   000019.SG2
 Mode:   Normalize (2x, clip=2)
 Gain:   0 dB                    Relative time:  0      ms
 Trace:  24        Time: 0    ms  Inverse time:  0      1/s
                                  Amplitude:     0.000  mV
```
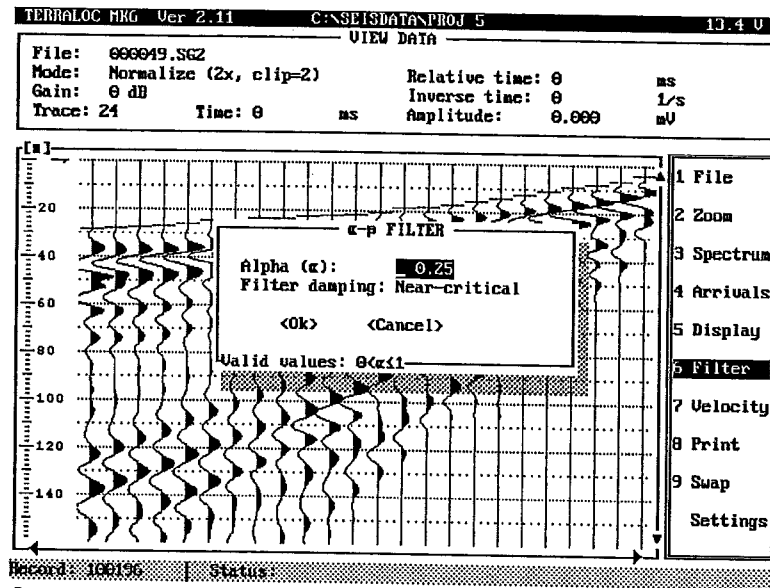

Figure 6.10   α-β *filter menu.*

$$\hat{u}_n = \hat{u}_{n-1} + \beta e_{mn} \tag{6.4}$$

$$\beta = \frac{\alpha^{\omega}}{2 - \alpha} \qquad ,0 \le \alpha \le 1 \tag{6.5}$$

$$\beta = 0.8 \left| \frac{2 - \alpha^2 - 2\sqrt{1 - \alpha^2}}{\alpha^2} \right| \qquad ,0 \le \alpha \le 1 \tag{6.6}$$

where s_{mn} =   measured value for the current sample.
       s_{pn} =   predicted value for the current sample.
       $\hat{s}_{n-1}$ =   corrected predicted value for the previous sample.
       $\hat{s}_n$ =   new corrected value for the current sample.
       $\hat{u}_{n-1}$ =   estimated amplitude gradient at the previous sample.
       $\hat{u}_n$ =   new estimated amplitude gradient at the current sample.
       e_{mn} =   error between the measured value and the predicted.

$0 \le \alpha \le 1$, controls the smoothing (see below), and β, depends on α according to (6.5) and (6.6).

Alpha

The α (alpha) parameter can take any value between 0 and 1, inclusive. A large α (near 1.0) results in very little smoothing and very little noise reduction. A small α (near 0.0) results in a lot of smoothing, i.e. a lot of noise reduction and very rounded estimates of data steps.

Filter damping

The filter damping can either be underdamped, or nearly critically damped. The calculation of the β (beta) parameter is based on the type of damping. For a underdamped system, equation (6.5) is used, and for a nearly critically damped system, equation (6.6) is used.

Remove DC-Offset

This is not an ordinary filter. It is a function, that calculates an average signal level in a trace and assumes that this is the DC-offset (it is actually the DC-component of the frequency content). This value is sub-sequently subtracted from every sample of the trace. See also page 6-20.
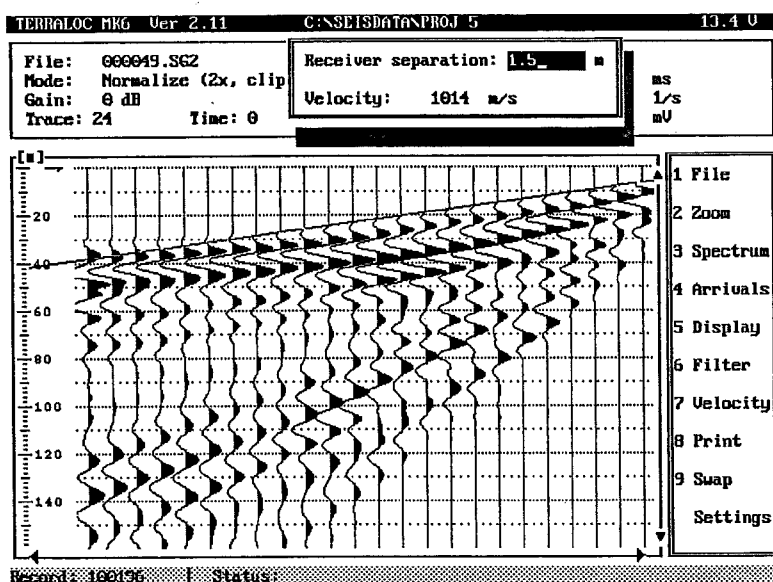
Figure 6.11   *Velocity analysis.*

Unfilter Data

Reloads the original data from disk. Thus, any performed filtering operations are undone.

6.2.7 VELOCITY

Selecting velocity, displays a line similar to the time marker line. At the same time a window is opened on top of the information window, and all commands in the command window are disabled.

In the new window opened on top of the screen, there is a field called "Receiver separation" , see Figure 6.11. The value of this field is calculated from the receiver locations co-ordinates.

In case of mismatch with the true separation, or the receiver locations have not been entered, you can change the receiver separation value. You just enter the desired value.

You can move this line by using the **<ARROW>** keys. **<UP>** and **<DOWN>** moves the velocity line across the screen, while **<LEFT>** and **<RIGHT>** tilts the line. When the line is tilted, the window on top, displays a velocity corresponding to the tilt. This way, you can move and tilt the velocity line in such a manner that it correlates with e.g. first arrivals in a refraction record. Thus, you can easily find out velocities for different layers.

6.2.8 PRINT

Prints the current record. If you are in the all traces or spectrum display modes, you will get a printout of the whole record. On the other hand, if you are in the zoom mode, you will get a printout of the current trace.
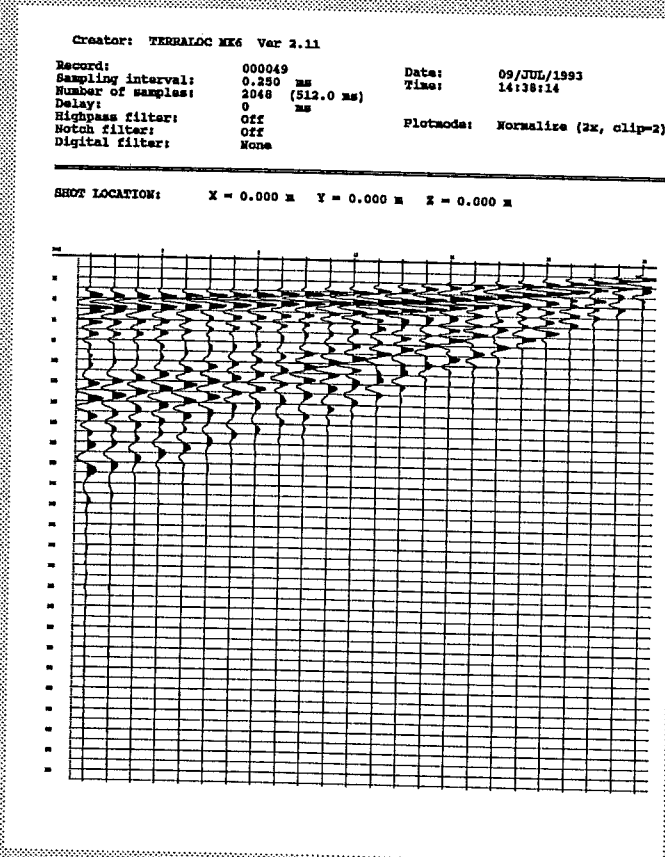
Example 6.1   Printout of current record.

You have to verify the printout before printing starts. The purpose of this, is to give you a chance to check that the printer settings are correct.

Example 6.1 shows you what a printout of a record looks like. In this printout, no receiver locations or first arrivals have been included.

6.2.9 SWAP

Sometimes it can be useful (and necessary), to interchange the locations of traces in the file (or on the display). This can be done in the View Data Menu by using the swap traces facility (Figure 6.12).
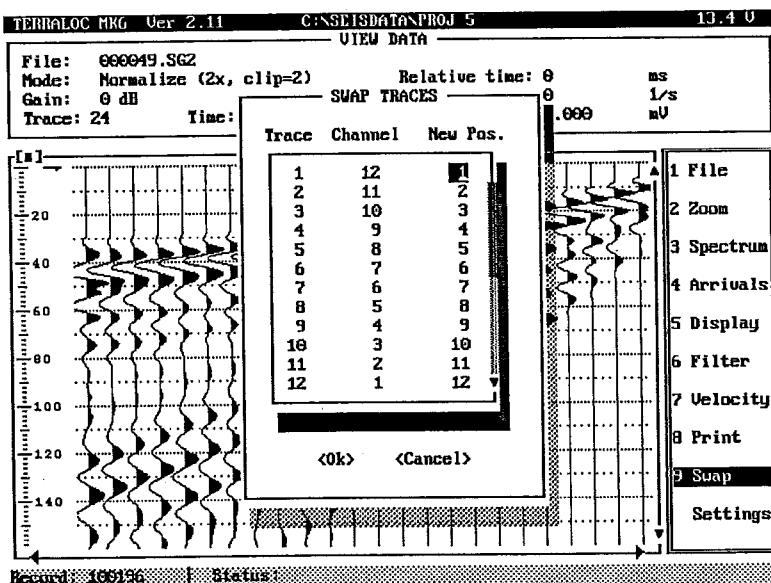
Figure 6.12   *Swap traces in the current record.*

In this menu, you will get a list of all the traces currently displayed. The first two columns show current trace number and the corresponding channel number (ie. the channel that actually supplied the signal). The last column, new pos., contains editable fields with the current trace order. Here you can set new positions for traces. To interchange two traces, eg trace 1 and 12, you need only enter 12 in the field for trace 1. Then, when you move to the next field, or press <ENT>, the list will be updated and the traces interchanged. To execute the interchanges, select <Ok>.

To return to the previous trace order, enter the swap traces menu, and select <Ok> without editing any new positions.

NOTE! You may have to check the receiver location co-ordinates after performing trace swapping.

This is one of the few menus, where pressing <ENT> in any field does not work as is <Ok> was selected. <ESC> however, works as if <Cancel> was selected.

6.2.10 SETTINGS

This accesses the same menu as the Settings in the measure menu (page 5-5). However, it is possible to change some of the parameters, e.g. shot and receiver locations etc. You cannot change the values for sampling interval, number of samples. It is similar to the situation when the instrument is in armed mode in the Measure Menu.

6.3 VIEW GEOPHONE TEST

The results of geophone tests are stored in formatted ASCII text files (section 5.11.3 and appendix D). Use this function if you want to view the contents of a report file. You can also use View Text Files, but this function lists only files with .RPT extension.

6.4 VIEW TEXT FILES

This function can be used to view files that contains only ASCII text. The maximum size of a file to view is 64 kBytes. If the file is larger than this, you will get an error message, "File is too long". You cannot view an empty file. By default all files in the current directory are listed. Select another file specification to list only limited list of files.

If you try to view a file that does not contain ASCII text, you will get only garbage on the screen.

6.5 VIEW OPTIONS

Set the options for displaying data on screen and printing data. All parameters are not available in all display modes. Any parameters not available - for a specific mode - are disabled in the menu.

Display Modes
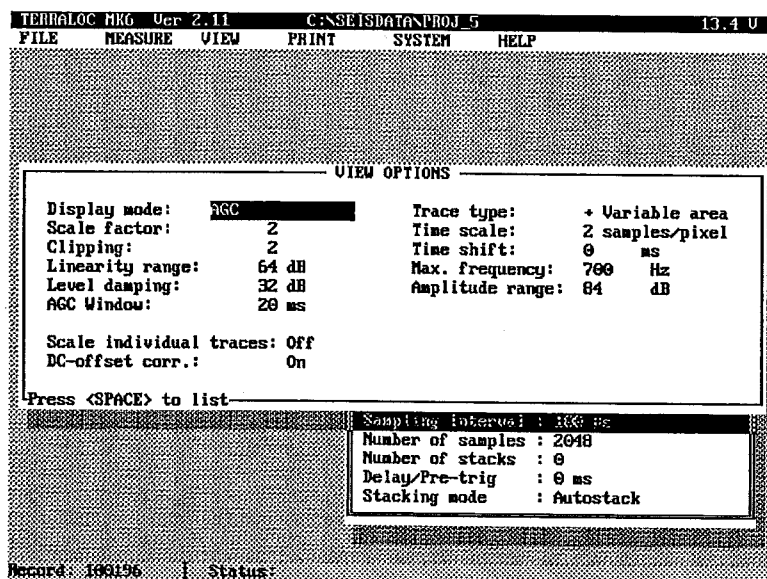
Figure 6.13   Display options menu.

The different display modes, affect the way the data are displayed on the screen, i.e. how data are scaled. It is crucial to understand the different display modes, how they work and how they are

affected by different settings of parameters, to be able to fully retrieve the information in the data. Figure 6.14 - Figure 6.16 show examples of some display modes. Note the first arrival in Figure 6.16. In the Clipped Logarithmic mode it shows very clearly, while it cannot be identified in the Normalize mode and is hardly visible in the AGC mode. This shows how important it is to find out the best viewing options for all situations.

Enhanced

Displays the stacked sum of the signal values.

Average

Displays the average of the stacked sum of the signal values. The values are divided by the number of stacks (shots) for that channel.

Normalize

Displays normalized trace amplitudes. Adjusts the maximum amplitude of each trace to the same value for all traces.

AGC

Displays the stack after digital automatic gain control adjustment made. Changes the display scaling along the trace to keep short-term mean amplitude constant. Decreases large signals and increases small ones. See also AGC window, page 6-18.

Logarithmic

Displays wave form amplitude on logarithmic scale. Specially suitable for refraction surveys when first arrivals are of paramount importance. Weak signals are increased, while strong signals are damped. See also linearity range, page 6-18.

Clipped log

The Clipped logarithmic mode is similar to the common logarithmic, but this function is asymptotic, which means that in the limit, larger amplitudes approach the maximum display value. The resulting waveform displayed look clipped, hence the name. See also linearity range, page 6-18.

Scale Factor

Use when you select either Normalize or AGC from the Display modes. Enter the required value from 1 to 100. If you type in an illegal value, the prompt line shows "Invalid entry". To clear an illegal entry just press <SPACE> or <CTR> + <BACKSPACE>. Do not press <ENT> to accept Scale Factor value; doing so closes the view option window. Just <TAB> to next field.
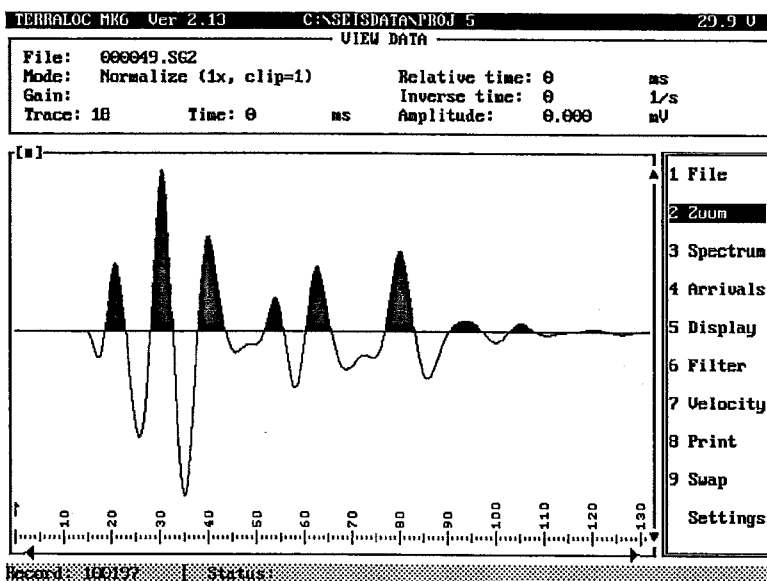
Figure 6.14   *Normalize mode, scale factor = 1, clipping = 1.*
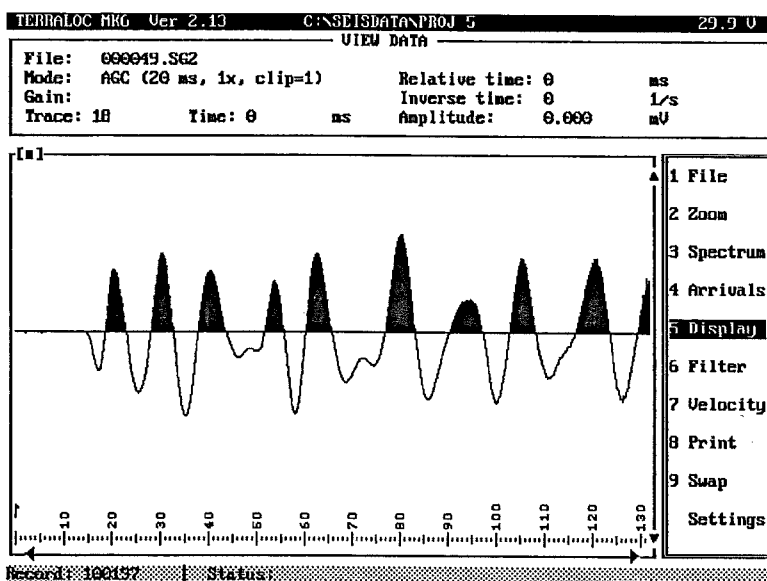
Figure 6.15   *AGC mode, AGC window = 20 ms, scale factor = 1, clipping = 1.*

Clipping Level

The prompt line shows

[Set Clipping Level measured in number of traces 0-24. 0 = no clipping]

A value of 1 clips the amplitudes of the samples to the size of one trace with no trace overlap. A value of 2 clips to the size of two traces, and so on. Enter a value from 0 to 24. If you type an illegal value, the prompt line shows "Invalid entry". To clear an illegal entry, press <SPACE> or <CTR> + <BACKSPACE>. Do not press <ENT> to accept Clipping Level value; doing so closes the view option window. If the clipping level is set to zero, no clipping will be applied.
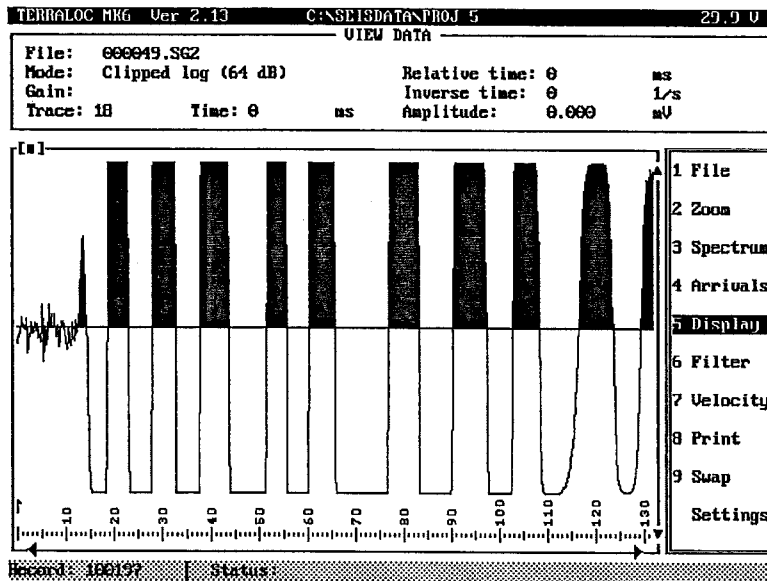
Figure 6.16   *Clipped logarithmic mode, linearity range = 64 dB.*

AGC Window

The prompt line shows

[Length of AGC window in milliseconds (1-32000).]

AGC (Automatic Gain Control) acts on recorded data in memory. It compensates for variations in signal strength along the trace. Large signals decrease and small signals increase. This ensures you see both high amplitude first arrivals as well as late arriving tiny reflections in the same trace display. You may set the length of the window for this trace equalisation. A good window should be as long as the period time of the dominating frequency. A value within the range 10 - 50 ms is generally a good starting point. Make tests with other values to see their effect on the recorded data.

Enter the required value from 1 - 32 000. However, the maximum length of the AGC window is equal to half the record length. Should you enter a too long window, the length is set to the actual maximum value. If you type in an illegal value, the prompt line shows "Invalid entry". To clear an illegal entry just press <SPACE> or <CTR> + <BACKSPACE>. Do not press <ENT> to accept AGC window value; doing so closes the view option window.

Linearity Range

Use when you select either Log or Clipped Log from the Display modes. The prompt line shows

[Dynamic range of linearity in logarithmic display modes (1 - 180 dB)]

Figure 6.17 shows the effect of the Linearity Range parameter. Inspection reveals that all three curves (A, B and C in the figure) are approximately linear for small amplitudes. This linearity, extends to higher amplitudes for curve C than for curve A. Thus, using a small linearity range leads to display of more details of lower amplitudes in the signal.
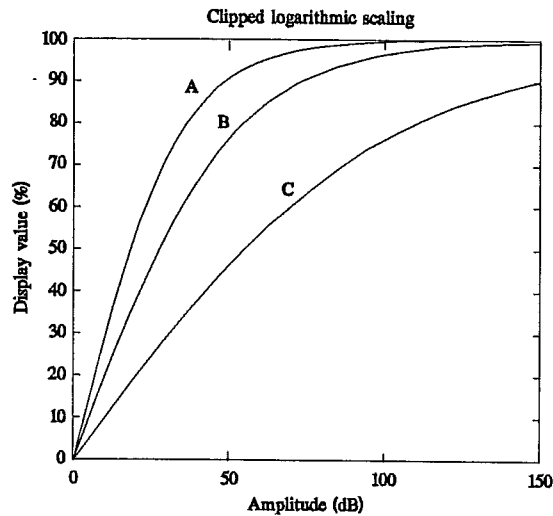
Figure 6.17   *The clipped logarithmic scaling function. Linearity range values: A) low, B) medium and C) high.*

Level Damping

Use when you select either Enhanced or Average from the Display modes. This value is used to damp large signal levels. Prompt line shows

[Damping of signal levels for Enhanced and Average (1 - 80 dB)]

Trace Type

Press **<SPACE>** to get a list with available trace types: *Wiggle trace, Variable area +, Variable area - , and Dotted trace*

Wiggle trace - displays (and prints) wave forms as continuous traces. Use for ordinary engineering refraction seismograms. Even when traces cross each other in several places, it is still possible to follow individual traces.

Variable area - displays (and prints) wave forms with positive or negative segments in black from zero voltage line to actual signal level. Use for reflection seismograms where time correlated reflection boundaries on neighbouring channels need visual enhancement. Useful as interpretation help to find location of P-wave arrival by visual correlation of neighbouring traces. This often shows arrivals more clearly.

If filled parts of traces cross each other they merge; it is not possible to separate them on either display or printout. For optimum results select Normalize, AGC, or Clipped Log display mode when using + or - Variable area.

Dotted trace - displays (and prints) wave forms as a series of sample points. Clearly shows slow varying signals up until the first break, when these then more or less disappear. This can be useful when first break picks are hard to see among the traces on the screen.

Time Scale

Press <SPACE> to get a list: *1 sample/pixel, 2 samples/pixel, 4 samples/pixel, and 8 samples/pixel*

There is a trade off between looking at every sample and see a longer part of the record. If you need maximum resolution along the time axis you should use 1 sample per pixel and if you want to see as much as possible of the data you should use 8 samples per pixel.

Time Shift

The prompt line shows

[Time shift of data in milliseconds (0-999)]

Type in a millisecond value from 0 - 999 to move individual traces so that all first arrivals line-up on the same time. If you type in an illegal value, the prompt line shows "Invalid entry". To clear an illegal entry just press <SPACE> or <CTR> + <BACKSPACE>. Do not press <ENT> to accept the time shift value; doing so closes the view option window. Just <TAB> to next field.

Maximum Frequency

Applies only to the Spectrum screen. Press <SPACE> to list predefined values: *100,250, 500, 1000, 2500, 5000, 10000, 20000, and 40000 Hz.*

You can also just enter an appropriate value as a text string.

Use <DOWN> or <UP> arrow to highlight a value. Press <ENT> to accept your selection. It will be the maximum frequency shown in the spectrum plot. Press <TAB> to next command.

The spectrum is displayed from 0 Hz, up to the given maximum frequency.

Max amplitude range

Applies only to the Spectrum screen. This parameter sets the range of amplitudes displayed in the spectrum display. If you set it to e.g. 84 dB, the scale of the display will go from -84 dB to 0. The amplitudes are measured relative to the maximum amplitude found in the trace.

Remove DC-offset

There is always a small DC-offset present in the data. The source of this offset can be found in the internal electronic circuitry. Besides this, the offset may be temperature dependent. If the maximum signal amplitude is very small with regard to the offset, data will be scaled according to the offset level. This shows up as a seemingly large offset. Normally, this feature should normally be enabled.

However, the DC-offset is small compared to the total dynamic range. In the worst case, the maximum DC-offset variation is less than 0.05 % of the total dynamic range. The effect on data quality can be ignored in almost all cases. The DC-offset will only be noticeable when the signal amplitude is of the same magnitude as, or less than, the DC-offset.

It is worth mentioning, that an extremely large signal peak, may cause a faulty DC-offset correction. Thus, with very large signals, it can be a good idea not to remove the DC-offset.

Individual scaling of traces

Sometimes it can be very useful to be able to scale just a single trace. This can be done if individual scaling of traces is switched on. You can see if the function is enabled in the information window, the gain parameter then contains a value. When the individual scaling function is disabled, the gain field is empty. The individual scaling does not work in all display modes.

To set individual gain factors to traces, select the desired trace as the current trace, and press <CTR> + <UP> and <CTR> + <DOWN>, to increase and decrease the gain, respectively. Note, that gain values are increased/decreased in steps of 6 decibels.

Press <CTR> + <TAB> in the view data menu, to access a list of the gain settings for each trace. The values in this list are the number of steps (each step corresponds to 6 dB) of the gain.

A positive gain means that the amplitudes of the trace will be upscaled, while a negative gain means that the amplitudes will be downscaled.

Figure 6.18 shows a record where no individual trace scaling is applied and Figure 6.19 shows the same record where individual trace scaling is applied to trace number 18 (18 dB).
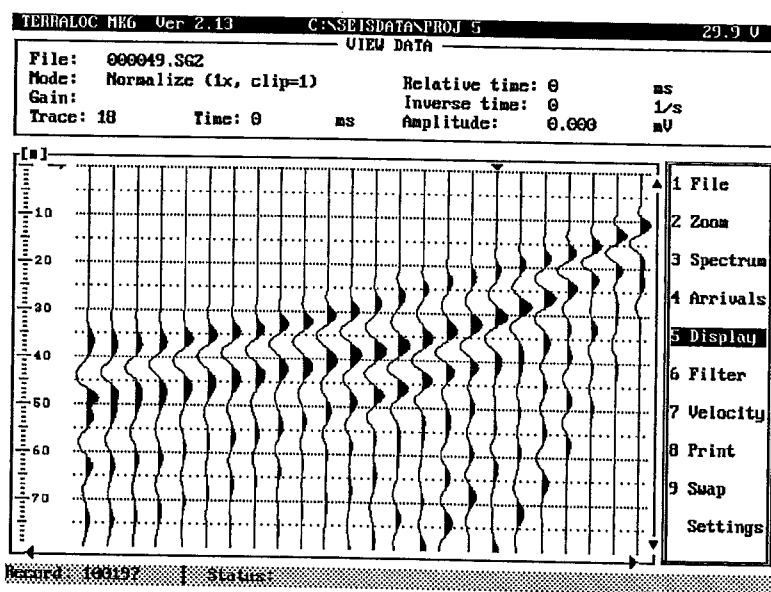
Figure 6.18   *Record displayed without any individual trace scaling.*

Please note that the individual trace gains cannot be saved to file and retrieved later. You have to set the gains individually for each trace and record. Also, it will take a little while for each change of a gain value, while the current trace must be rescaled, and the display redrawn.
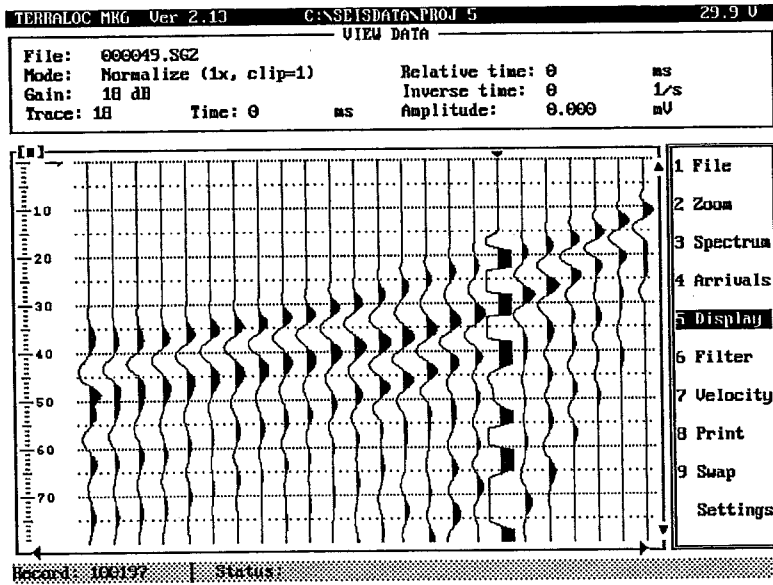
Figure 6.19   *Record displayed using individual trace scaling. Gain (18 dB) applied to trace number 18.*

Chapter 7

7 PRINT MENU

- *Data*	Print one or more data files.
- *Geophone test*	Print one or more reports generated by the geophone test.
- *Files*	Print one or more file.
- *Options*	Select printer type, printer port, resolution etc.

If there are several files to be printed, you can use this feature to select a number of files to print. The maximum number of files that can be selected is 1024.

7.1 SELECTING FILES TO PRINT

Whether you want to print data, geophone tests or other files, the procedure of selection and execution is identical in all menus.
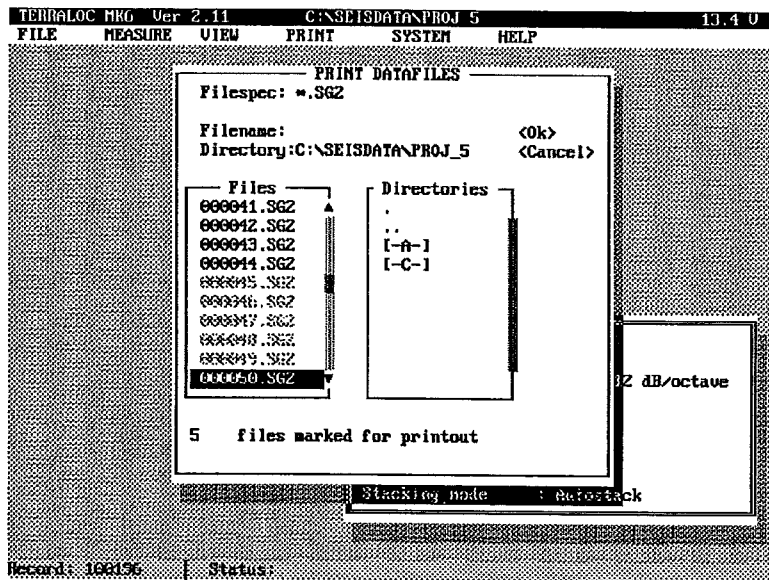
Figure 7.1   Selecting a number of files from a list of the contents of the current directory.

Selecting one of the print procedures, opens a menu containing a file list and a directory list. The function of the menu is similar to the file manager. If you want to print files located in another directory, you move to that directory in the directory list (this directory will be the current working directory). You can use the file specification, to set the filename pattern used for including files in the list.

To select files, move the cursor to a file and press <ENT>. The files selected are highlighted. You deselect files in a similar manner, move the cursor to a selected file and press <ENT>. To select all the listed files, press <CTR>+<ENT>, and to deselect all selected files, press <CTR>+<BACKSPACE>.

When all files to print have been selected, move to the <Ok> button and press <ENT>. You will get a menu showing the selected printer type and the destination of the printout. The print action must be verified to be executed.

You may press <ESC> anytime, to stop printing. As soon as the program gets a chance it will interrupt the printing process and ask if it is all right to stop printing. In the print data mode, it will do so before starting a new graphic line. In the other modes, the program can only stop printing before starting with next file.

7.2 PRINT DATA

Select one or more files to print. The files must be SEG-2 standard format files. Please note that, all files selected will be printed using the same display options.

7.3 PRINT GEOPHONE TEST

Select one or more files to print. As default, all files with extension .RPT are listed. The TERRALOC generates such files after each geophone test. The format of geophone test report files can be found on page D-1.

7.4 PRINT FILES

Select one or more files to print. The files must be in a printable format, i.e. they have to contain either pure ASCII text or valid printer control codes. Valid printer codes means that, all information for graphics, formatting etc., have to be intended for the printer connected. If you, for example, try to print a SEG-2 data file, the printer will print only garbage.

7.5 PRINTER OPTIONS

The selections of graphic resolution, receiver locations and first break picks below, are only valid when printing data. Otherwise, the settings are ignored. The settings are saved when leaving the program.

Printer type

Select a printer from the list. The printer you connect to TERRALOC must be in the list. If your printer cannot be found in the list, check if it is compatible with one of the printers in the list and select that one. The printers supported are: EPSON FX-series, IBM Proprinter, Gulton Superplot-80,

```
 TERRALOC MK6   Ver 2.11        C:\SEISDATA\PROJ 5                    13.4 U
  FILE    MEASURE   VIEW    PRINT    SYSTEM    HELP

                                              Epson FX-80
                                              Epson FX-85
                                              Epson FX-100
                                              Epson FX-286
                         PRINTER OPTIONS       Gulton Superplot-80
                                              HP Deskjet 500
         Printer type:              Panasonic  HP Laserjet+
         Printer destination:       LPT1:      IBM Proprinter
         Printer graphic resolution: High      Panasonic KX-P1083
                                              Panasonic KX-P4450
         Include receiver locations: No        Penplus
         Include first break picks:  Yes       Seiko DPU-411
                                              Seiko LTP-5442
        Press <SPACE> to list
                                    Notes Filter      : Off
                                    Sampling interval : 100 μs
                                    Number of samples : 2048
                                    Number of stacks  : 0
                                    Delay/Pre-trig    : 0 ms
                                    Stacking mode     : Autostack

 Record: 100196    | Status:
```

Figure 7.2   Printer options menu.

HP LaserJet+, HP DeskJet 500, PenPlus, Seiko DPU-411 and Seiko LTP-5442.

More printers will be added to the list in the future.

If the printer cannot interpret the control codes sent by the program - you may have selected wrong printer type - the program might hang. Should this happen, switch off the TERRALOC and then switch it on again.

Printer destination

Select the destination port for the printer output. This can be the parallel port (LPT1:, Centronics) or the serial port (COM1:, RS-232). If the program runs on an external computer you may select other parallel and serial ports, any of LPT1:-LPT2: and COM1:-COM4:.

If you are going to use a printer connected to the serial port, remember to set the parameters for the serial communication (see page 8-4).

Printer graphic resolution

Sets the printer resolution when printing graphics. The resolution depends on the printer used. There may be some printers for which you cannot select graphics resolution. Using high resolution gives high quality printouts, but each printout takes longer time. Use low resolution for fast printouts.

Include receiver locations

If you include receiver locations, these will be listed after the shot point location. The list contains trace number, X-, Y- and Z-coordinates as well as first arrivals. Remember, that including receiver locations increases the time for printouts and consumes more paper.

Include first break picks

When first break picks are included, these are marked on the printout by short horizontal lines. To have the first arrivals printed in text form, you have to include the receiver locations (see above).

Chapter 8

8 SYSTEM MENU

- Setup   Opens the System Setup Menu for setting system parameters.
- Serial Comm.   Setting of parameters for serial communication port.
- Set Date & Time   Setting of the systems real time clock..
- Color palette   Change colors for the window system. Save and load color palettes from disk.

8.1 SETUP

Silent mode

Disables display of progress boxes. This speeds up saving data to disk. Even though progress boxes are not displayed, you will still have informative messages on the status line.

Info box

Disables display of the info box in the Main Menu.

Auto save

Saves data immediately when <SAVE> is pressed or when the maximum number of stacks has been recorded.

If auto save is OFF, a dialogue box is displayed where you can enter a new filename of your choice. Default value is: OFF.

Auto overwrite

If there is a previous datafile with identical record number as the current, the previous is automatically overwritten if the TERRALOC is in auto overwrite mode.

Auto update

Parameters that normally change between records are automatically updated. You should have entered correct values for the Move-up shot, Move-up receiver array and Move-up reference channel.

NOTE! The record number is always updated.
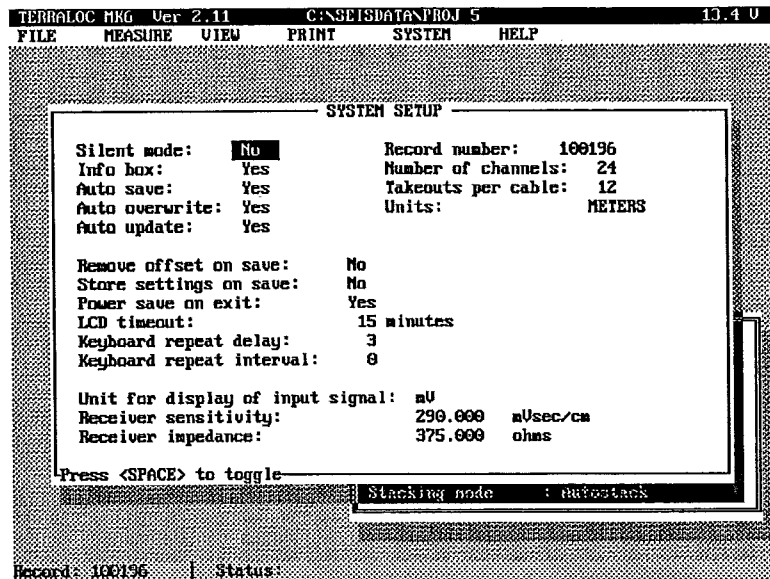
Figure 8.1   *The system setup menu.*

Record number

In the status line on the bottom line of the screen, the record number appears as a six digit number. This is the indentification number that will be given to the next measurement that is stored on disk, i.e. the record number will be used to create the filename of that record. This can be any value between 000001 and 999999. The default record number is the current record number. When you edit the record number, you can ignore all leading zeroes as they are added when you exit the system setup menu. The record number is automatically incremented after an acquired record is saved to disk.

If a parameter file (C:\MK6\SYS\MK6.STS) cannot be found during startup, the file C:\MK6\SYS\RECORD.LOG is scanned. This file contains a log of all data files saved to disk, when they were saved, and on which directory. The default record number is then, the greatest number found plus one. The logfile and parameter file **must** be located on the C: disk and in the C:\MK6\SYS directory.

If the log-file is also missing, the default record number will be 000001.

Number of channels

This value sets the number of active channels. If, for example, you are doing twelve channel seismic, you should set the number of channels to 12. Otherwise all available channels will be saved on each record.

Any channel may be used or re-assigned in the Receiver Spread Menu. However, the total number of channels used cannot exceed the number entered in this field.

Takeouts per cable

When you use the Automatic Receiver Layout Menu, you should input the number of receiver takeouts for the cables used. If you are going to operate the Automatic Receiver Layout Menu, it is important to note, that you can only use similar cables, i.e. the number of takeouts must be equal for all cables in the layout.

Units

Select the units of measure you use. You can use: *NONE, METERS, CENTIMETERS, FEET, and INCHES.*

It is primarily for information in the SEG-2 standard format files, but also has meaning for velocity analysis (velocity units are: m/s, ft/s, etc.).

Remove offset on save

Removes the DC-offset before saving data to file. If this feature is disabled, saving data will be slightly faster. The default status is disabled. See also the remove DC-offset feature with the view options on page 6-20 for more information.

Store settings on save

When store settings on save is ON, the settings are saved in a *.MK6 file along with the data file. This gives you a formatted text file, containing information about how the system was set-up when the data were recorded. The format of the settings file is described on page C-1.

Power save on exit

Switches off all TERRALOC MK6 internal circuitry when exiting from the program. Only the computer electronics remains switched on. Use this to save power when running third party software on your TERRALOC MK6. You can reduce power consumption about 60%.

LCD timeout

Select the timeout of LCD backlighter in minutes. The TERRALOC MK6 keeps track of the last action performed and if nothing more happens during the selected number of minutes, the LCD backlighter will be switched off. If the timeout is set to 0, the timeout function is disabled.

If you are going to use the instrument over a considerable timespan, running on battery, you should use the LCD timeout. The backlighter consumes about 10% of total power and you may save the battery when it is off.

Keyboard repeat delay

Sets the delay time between pressing of a key and start of the auto-repeat for the TERRALOC built in keyboards. The longest interval index is 12 and the shortest is 0. Note that there is no auto-repeat when using the <SHIFT> or <CTR> keys.

Keyboard repeat interval

Sets the repeat interval for the TERRALOC built in keyboards. 0 gives the fastest keyboard repeat and 10 gives the slowest. Note that there is no auto-repeat when using the <SHIFT> or <CTR> keys.

Unit for display of input signal

The units used for sample values displayed in the information window of the Measure and View Data Menus. Possible values are;

> *none*   displays sample value directly from the A/D converter
> *mV*   displays value in millivolts
> *cm/s*   displays value as a particle velocity at the geophone.

When using cm/s, make sure you have the correct settings of receiver sensitivity and impedance, as well as TERRALOC MK6 input impedance.

Receiver sensitivity

Enter the sensitivity for the receiver you use for data acquistion. This value is used to calculate the particle velocity at the receiver. All receivers have to have the same sensitivity. Sensitivity is measured in mVs/cm.

Default: 290.0 mVs/cm.

Receiver impedance

Enter the value for the impedance (resistance) of the receiver. This parameter is also used for the calculation of the particle velocity. The impedance is measured in ohms (Ω).

Default: 375.0 Ω .

8.2 SERIAL COMM.

TERRALOC MK6 comes equipped with a port for serial communication (RS-232). You might have to set the communication parameters for the TERRALOC serial port (COM1:). It is very important that all the parameters below (baudrate, parity, databits and stopbits), are equal at each end of the communicating line. For example, TERRALOC MK6 and a printer, or a modem.

Example of devices that can be connected to the serial port are: printers, modems, a mouse, another computer etc. From the TERRALOC MK6 program, you can only access a serial mouse and a serial

printer. If you need some other device, you must run another software and connect an external keyboard.

Baudrate

The baudrate sets the speed, with which data are transmitted and received. The possible values are: *110, 150, 300, 600, 1200, 2400, 4800, 9600*
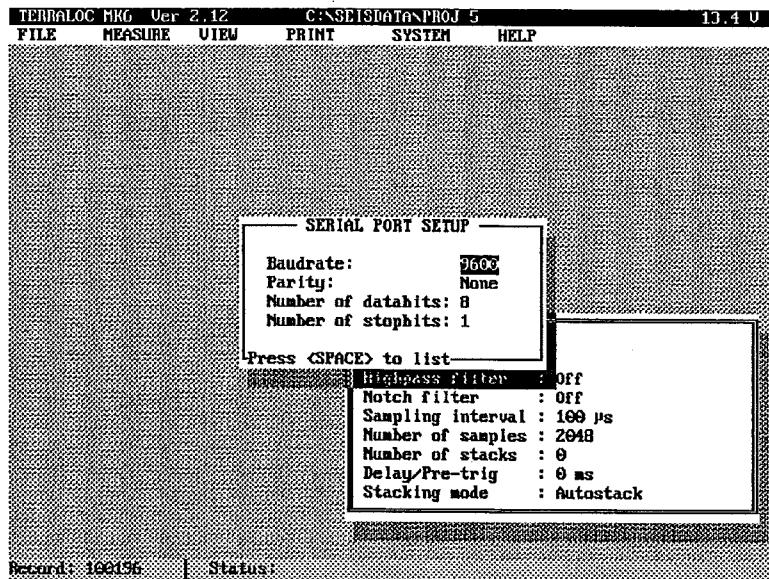
Figure 8.2   *The serial communications menu.*

Parity

Parity, is a form of error checking of the transmitted character. The possible values are: *None, Odd, Even*

Number of databits

Refers to the number of bits used to define a character, transmitted or received. The possible values are: *7, 8*

Number of stopbits

The stopbits are used to disinguish where one character ends and the next starts. The possible values are: *1, 2*

8.3 SET DATE & TIME

This menu is used to set the data and time of the internal real-time clock. The real-time clock works on an internal battery, thus and it is running, even when the instrument is switched off. When data are saved to disk, the real-time clock is read, and the date and time are stored in the data file.

When the menu is opened, the date and time fields are set to the current contents of the real-time clock. Note, however, that the date and time are not updated while the menu is open. The real-time clock is set when <Ok> is selected and only if any changes have been made to either date or time (or both).
Date

Enter the new date for the real-time clock. The format is: MM/DD/YY, where MM = month, DD = day, and YY = year.

Time
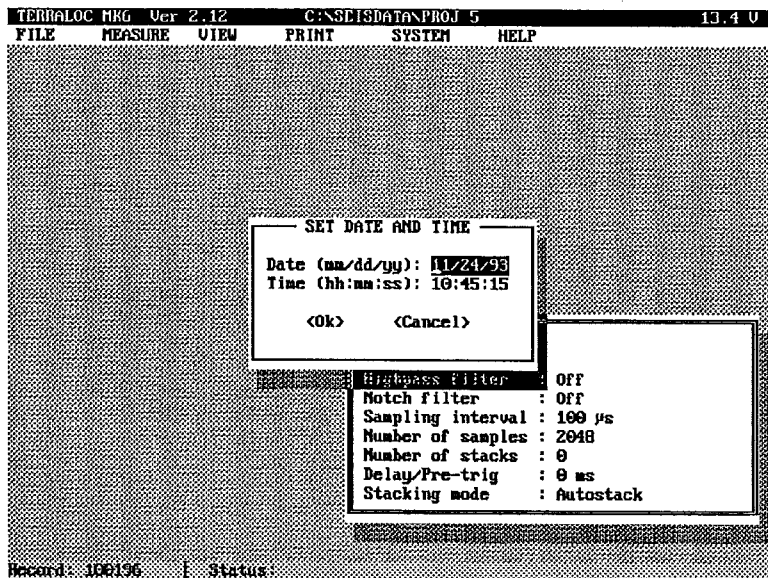
Figure 8.3   *The date and time menu, for setting of the computer's real-time clock.*

Enter the new time for the real-time clock. The format is HH:MM:SS, where HH = hours (24-hour format), MM = minutes, and SS = seconds.

8.4 COLOR PALETTE

Colors

The background and foreground colors for every type of menu field are listed here. You may change the values according to Table 8.1 to get the color composition you prefer. This is most useful if you are using an external color monitor.

To change the color for a field, move the cursor to the desired row for type of field and column for background or foreground. Change color index by pressing <+> or <->. The current color for this field is displayed in the example window.
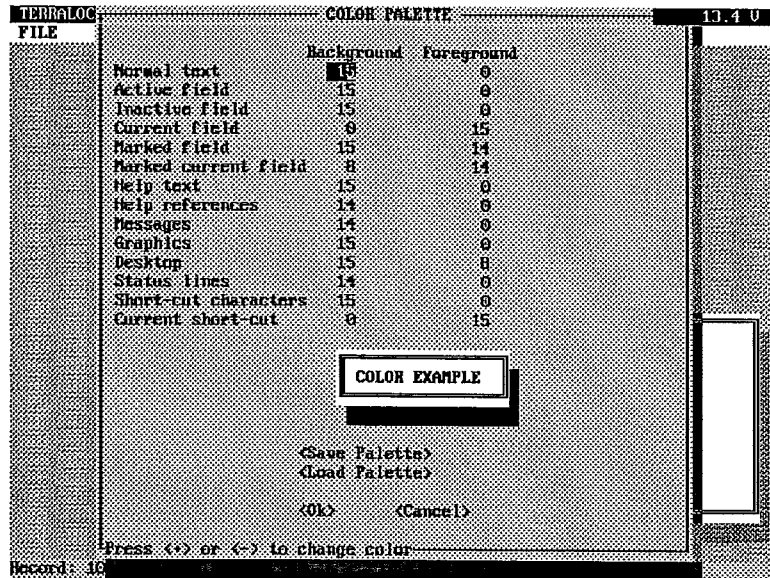
Figure 8.4   *The color palette menu.*

Load palette

Lists the color settings files (*.COL) in the C:\MK6\SYS directory. The installation program creates two default color files, GREYSCL.COL and COLOR.SCL, with appropriate settings for greyscales and color respectively. The color settings last used, are saved in the file SESSION.COL when exiting the program. You cannot change to another directory. All color settings files are stored in a fxed directory.

Table 8.1   *The available colors and corresponding decimal values.*

BLACK	0
BLUE	1
GREEN	2
CYAN	3
RED	4
MAGENTA	5
BROWN	6
WHITE	7
DARK GRAY	8
LIGHT BLUE	9
LIGHT GREEN	10
LIGHT CYAN	11
LIGHT READ	12
LIGHT MAGENTA	13
YELLOW	14
BRIGHT WHITE	15

Save palette

Save the current color settings to file on the disk. All color settings files are stored on the C:\MK6\SYS directory and have extension ".COL".

Chapter 9

9 HELP MENU

- *Cross-reference*	Opens the index pages, of the context sensitive cross-reference help.
- *Error Messages*	Opens the cross-reference help for error messages.
- *File Formats*	Opens the help texts about file formats.
- *Mk6 Manual*	Opens the help texts of the MK6 manual.
- *About...*	Some information about the TERRALOC MK6.

There are two types of help screens: View and Cross-reference.

In the "View" screens you can scroll the displayed text using <UP>, <DOWN>, <SHIFT> + <UP> and <SHIFT> + <DOWN>. To move to the top and bottom, respectively, press <SHIFT> + <LEFT> and <SHIFT> + <RIGHT>. <ESC> exits the help screen.

In the "Cross-reference" screens, all texts fit into one window. The <ARROW> keys are used to move the cursor to the highlighted cross-references (topics). <BACKSPACE>, takes you back to the previous topic. <ESC> exits the help screen. The context-sensitive help and the error messages help, are cross-referenced.

9.1 CROSS-REFERENCE

A context sensitive help system is integrated in the MK6 program. Pressing <HLP>, brings up a help screen with a short explantory text about the current topic, i.e. what is specific about the current menu
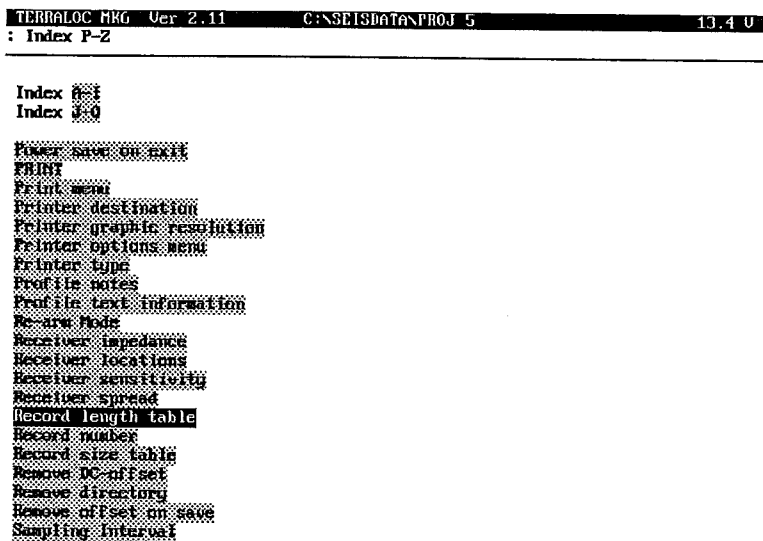
Figure 9.1   *One of the index pages in the context sensitive cross-reference help.*

or field. Some words on the help screen are highlighted. These words are nodes in a cross-reference help system. Selecting a highlighted word and pressing <ENT>, brings up the help text connected to that word.

The context sensitive cross-reference help, can also be accessed from the main menu. When you select "Cross-reference" from the help menu, you get the index page (see Figure 9.1). Select a topic of interest from the alphabetical list.

9.2 ERROR MESSAGES

In appendix E all MK6 error messages are listed, together with the explanations.

Figure 9.2   *Get an explanation of error messages from the help system.*

9.3 FILE FORMATS

Opens a list of choices for information about some of the file formats used in TERRALOC MK6. You can also access this help fucntion by pressing <SHIFT> + <HLP>.

9.4 MK6 MANUAL

Get access to the MK6 on-line manual. The help texts are ordered by chapter. Only the text from the Reference Manual can be viewed. All figures, tables and so on, are excluded. You can also access this help fucntion by pressing <CTR> + <HLP>.

9.5 ABOUT...

The "About" menu item, displays a window with some program information. The name and version number of the program, compilation date, type of license, the serial number and available memory.

Figure 9.3   Information about the MK6 program.

Chapter 10

10 MAKING MEASUREMENTS

To ensure good data quality in a seismic survey, whether it is refraction, reflection, tomography or any other method, it is very important to be careful when setting up the system. There is, however, no specific standard field work procedure. It has to be adapted to the survey at hand, the desired information and the geological conditions. Here, only a general procedure about setting up of the instrument will be given.

In this chapter, we assume that all objectives and requirements are known. The information given tells you mainly what parameters need to be set, and some suggested values. Use this chapter as a rule of thumb for setting up TERRALOC MK6 for measurements. Section 10.3 describes the setting up procedure in a chronological order.

10.1 SEISMIC METHODS

There are a variety of seismic methods used. The objectives of the survey controls which specific method to use. This section will give you an overview of some commonly used methods. Please refer to the bibliography at the end of the manual, if you need a more detailed and thorough description of seismic methods.

In the refraction and reflection methods, there is usually a division between shallow and deep surveys.

10.1.1 REFRACTION

The objective is to find out the arrival times of the head waves to map the depth to the refractors in which the waves travel. The refraction method is based on the assumption that the earth is made of layers of materials that increase in seismic velocity with each successively deeper layer. The key element is that an incident ray is critically refracted along the boundaries between layers, before returning to the surface. From the first arrival times it is possible to calculate the seismic velocity for each layer and the depth to the boundaries. The seismic velocity gives information about material properties, and what kind of material comprises each layer. Additionally, frequency analysis of the recorded signals can give more information about the material properties.

The principles for seismic refraction techniques can be found in most geophysical textbooks. For a more detailed description of both theory and practice, see Sjögren (1984).

Investigations performed with the refraction method, can yield a variety of reliable data such as depth of various overburden layers, depth to bedrock, soil compositions and solidity, rock quality, rippability, excavability, water tables and rock structure.

The refraction seismic method can be used for a wide range of applications, for example:

Underground	Tunnels and their entrances, machinery halls, gas and oil storage facilities, air raid shelters.
Foundations	Heavy industrial buildings, bridges, harbour quays and breakwaters, dams, piling, airfields.
Excavations	Harbour basins and entrances, pipelines, canals, roads, railways.
Resource searches	Gravel, sand and quarry sites.
Water prospecting	Groundwater table in the overburden, water bearing sections of rock.
Ore prospecting	Mineralized weathered zones, buried channels with high mineral content.

10.1.2 REFLECTION

In this method, the arrival time events are attributed to seismic waves that have been reflected from interfaces where changes in acoustic impedance occur, and of waveshape changes.

The seismic reflection method has mainly been used for deep investigations (depth > 30 m) in oil prospecting. During recent years however, shallow reflection investigations have become common for engineering and environmental purposes. It is now an important complement to refraction investigations, and has even sometimes replaced refraction. The main reasons for the increase in use of the reflection method is the development of light weight, high-performance seismographs and the possibility of advanced data processing on inexpensive personal computers. Thus, the cost for reflection investigations has decreased considerably.

Both acquisition and processing of reflection data are more complex and time consuming than they are for refraction data.

10.1.3 OPTIMUM OFFSET

This is a special case of the seismic reflection method, in which data are recorded with a fixed source-receiver offset. It is a method for shallow investigations. The offset is chosen to be an optimum value (hence the name), and typically, it is a window where the reflection from the target is located between the refracted first arrivals and the ground roll in the seismogram.

10.1.4 TOMOGRAPHY

The general idea for tomography, is that information about the properties of the interior of a region can be obtained through measurements at the boundary. Thus, this is a method for finding the (2-dimensional) distribution of some physical property (e.g. velocity, reflectivity, bulk modulus, etc.). It can involve borehole-to-borehole, surface-to-borehole, or surface-to-surface measurements. The main restriction is that the source and receiver positions, and hence any boreholes, must be confined to the same plane. This plane can have any orientation.

Usually, the travel times for a large number of ray paths through the rock volume are measured, and sometimes, even amplitudes (direct or reflected) are analysed. Then the dataset goes through an inversion process, where the spatial distribution of the physical property is estimated. The technique is very computational intensive, and is costly because of the need for boreholes.

The final results are usually presented as maps or plots, where the values of the physical property are coded in color or grayscale.

An introduction to this method can be found in Worthington (1984).

10.1.5 VSP

Vertical Seismic Profiling, measurements with the receivers located in a borehole and the source located on the ground. If the source is moved away from the head of the borehole, it is called "offset VSP". In "Reversed VSP", the receivers are located on the ground and the source is located in the borehole.

The VSP technique is seldom used alone, but is rather used to provide better interpretation of seismic reflection data. VSP allows accurate determination of one-way travel time to various geologic units and analysis of attenuation and acoustic impedances which are needed for construction of synthetic seismograms.

A brief introduction to this method is given in Cassel (1984).

10.1.6 VIBROSEIS

A seismic method in which a vibrator is used as an energy source to generate a controlled wavetrain, instead of the usual impulsive sources (e.g. hammer, explosives, shot guns, etc.). This method requires recording of the source signal for reference.

A sinusoidal vibration of continuously varying frequency is applied during a sweep period typically lasting for several seconds (>10 s.). The sweep may start at either low, or high frequencies, and it can be linear or nonlinear. The recorded data, comprising many superpositioned wavetrains, has to be correlated with the source signal. The correlated record resembles a conventional seismic record such as results from an impulsive source.

10.2 FIELDWORK PROCEDURE DESIGN

As stated in the beginning of this chapter, there is no specific standard field work procedure. Each survey is somehow unique.

Some basic understanding of seismic surveys can be found in most textbooks on geophysics, e.g. Parasnis (1986).

10.3 SETTING UP TERRALOC FOR MEASUREMENT

When the instrument has been located at the site, connect all necessary cables; power input, receiver layout, trigger device etc., and switch on the instrument. TERRALOC makes an internal test during start up.

Thanks to the use of IFP (= Instantaneous Floating Point) amplifiers in TERRALOC there is no need to set amplifier gains. The amplification of the input signal is fully controlled by the instrument.

10.3.1 WORKING DIRECTORY

It is recommended to have a unique working directory for each project or survey. Because, there are often a large number of files (data, settings, geophone test reports etc.) associated with a project. Storing all files in one directory only, results in long waiting times when listing files for viewing, complex management of files for the operating system and increased risk for overwriting old data files.

You may well create the directories in the office, using an external keyboard. This way, you can use descriptive names, e.g. PROJ_5, VSP_34, or any other appropriate name. Remember that you can use max eight characters in the name. You may also create directories in the field using the internal keyboard. However, remember that you are restricted to names consisting of numbers only.

The next time you start the program (switch on the instrument), the last working directory will, by default, become the current working directory.

10.3.2 SYSTEM SETUP

When you have selected a working directory, you can open the System Setup Menu. The System Setup Menu can also be opened almost anytime by pressing **<CTR> + <ESC>**.

Now you can set a new record number. It can be a good idea sometimes to use record numbers that have some meaning. For example, you can let the first three digits in the record number correspond to the number of the profile.

If you are going to use fewer channels than is installed, you should select the number of channels that actually will be used during measurements. Failing to disable unused channels results in saving more data than necessary.

You can also select how data is saved on disk, e.g. automatically on save command, overwrite already existing data, etc.

10.3.3 PARAMETER SETTINGS

Now it is time to set the parameters for the data acquisition. The two most important parameters to set, are sampling interval and number of samples per trace.

10.3.4 TRIGGING THE INSTRUMENT

To make a recording with the TERRALOC seismic system, an initiating trigger signal is required. The trig pulse defines the start of the data recording and is the reference for all timing.

USING A TRIGGER GEOPHONE

A standard geophone planted close to the impact point provides a pulse when the impact wave starts propagating in the ground. To operate with a trig geophone, the trig input mode has to be in the "Analog" mode. The sensitivity of the trig input can be (and should be) adjusted with the analog input sensitivity control, see p 5-19.

MAKE/BREAK SWITCH INPUT

The system will trigger if the wires of the trigger cable are shorted together (make switch), or if the shorted wires are opened (break switch).

When you use explosives, one trigger method is to put a few turns of wire around the charge. The wire is cut by the explosion and triggers the seismograph (break switch). You can also twist a pair of insulated wires together and insert the twisted part into the dynamite. The explosion will compress the wires and crush/melt the insulation causing the leads of the wires to short together. This will trigger the seismograph (make switch).

Besides, this make switch trigging method can be applied when you use falling weight or hammer as energy source. However, you must use a metallic shock plate and the falling weight or the hammer head must be made out of metal. Connect one lead of the trig wire to the shock plate and the other lead to the falling weight or hammer head. When the hammer hits the shock plate, the trigger circuit is shorted and the instrument triggers.

USING THE TRIGGER COIL

If you want to trig TERRALOC MK6 on the ignition current going out to the charge, you can use the Trigger Coil (current detector unit) included in the TERRALOC MK6 accessories. To use this you merely feed one of the two shot wires through the hole in the trigger coil. The trigger coil is either connected directly to the trig input or to the extension connectors on the trig cable reel. Then TERRALOC is put in the "Analog" trig input mode with the sensitivity control set at about 50 %. When the charge is fired, the ignition current will trig TERRALOC instantly. The current pickup trig method is very convenient since you only need to bring one cable to the shot hole.

NOTE! You have to use (seismic) blasting caps with no built-in delay to be able to use this method. If you use ordinary blasting caps the ignition delay will be included in your record. There are seismic blasting caps of the safety type available from NITRO NOBEL. Their delay is only some 50 μs if fired with the high power NITRO NOBEL blasting machine.

RADIO TRIGGERING

In case you need to trigger the TERRALOC in places where you cannot use a trig cable, you can use a simple radio equipment to transmit the trig pulse.

10.4 MEASUREMENT MODES

Data acquisition can be performed in three different measurement modes with TERRALOC MK6: standard, roll-along and optimum offset (also called common offset). The standard mode is the common way to record data, while the roll-along and optimum offset modes are usually applied to special cases.

10.4.1 STANDARD MODE

The standard measurement mode, is the most commonly used. It does not update any parameters besides shot number, shot location and receiver locations (if auto update is enabled). This is the simplest measurement mode to use for data acquisition.

10.4.2 ROLL-ALONG MODE

This measurement mode emulates the functionality of a mechanical roll-along switch.

10.4.3 OPTIMUM OFFSET MODE

This measurement mode should be used to facilitate optimum offset surveys.

10.5 INTERCONNECTING TWO OR MORE TERRALOCS

10.6 OPTIMIZING THE PERFORMANCE

Many of the settings you select, have to do with the performance of the system. You can set up the system to do the data acquisition as fast as possible, or to give you as much information during the acquisition as possible (often this means a more secure operation).

10.6.1 OPTIMIZE FOR SPEED

Sometimes, for example in marine seismic surveys, it is important to obtain fast data acquisition. There are some operations that can be modified, or even skipped, to enhance the acquisition speed. Still, there are some operations that are fixed, and to this category belong

the actual data acquisition (sampling procedure), transfer of the data from acquisition memory to trace memory, and writing of the data to disk.

Saving data to disk can of course be speeded up if you use a disk cache program. For example, Microsoft SMARTDRV, Norton NCACHE.

The Microsoft SMARTDRV program has at least one disadvantage; it empties the cache buffer regularly, causing the acquisition to be interrupted for a short while. The best results, so far, have been obtained using the Norton NCACHE.

However, the following should be considered:

- Do not display data after shooting, i.e. use "Fast stack", since scaling of traces takes a considerable time.
- Do not use "Oversampling".
- Use as short records as possible (number of samples).
- Set the instrument in "Silent mode".
- Do not remove DC-offset before saving data to disk.
- Do not write settings to disk for each record written to disk.
- Enable "Auto save", "Auto overwrite" and "Auto update".

10.6.2 OPTIMIZE FOR SECURITY

When you optimize for security, you set the instrument up, to give you as much information about the data acquisition as possible. This means that, e.g. data and progress are displayed. Also, you may select not to automatically overwrite already existing data files.

- Do not use "Auto overwrite"
- Use "Preview" or "Stack once" stack modes.
- Use the noise monitor if you are in Stack Once mode.
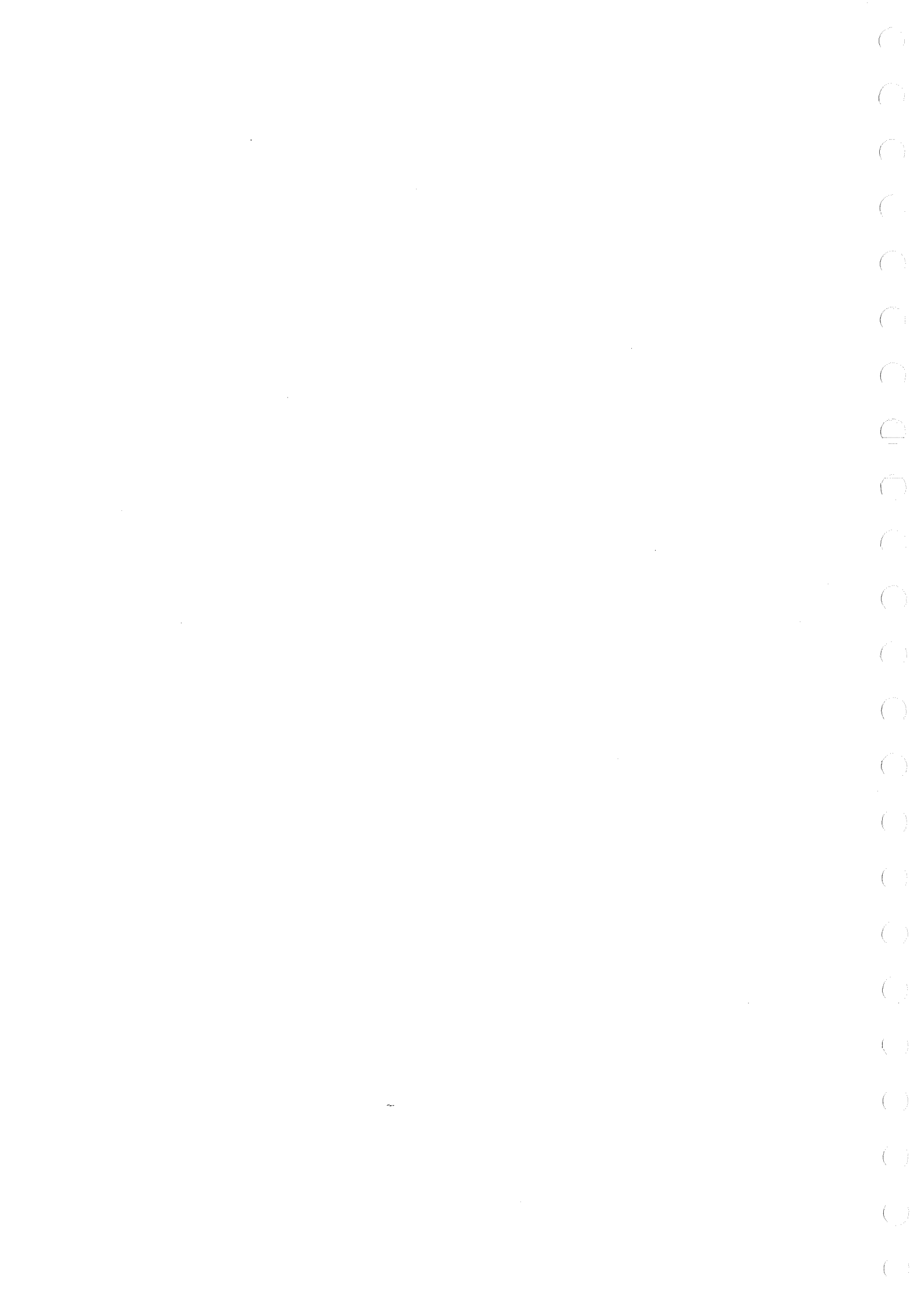
Chapter 11

11 TROUBLE SHOOTING

Although great care has been taken to make TERRALOC MK6 as safe as possible, it is always a small risk that something does not work properly. Should you have trouble getting things to work, please refer to this chapter. This is a guide to the common problems and how to work them out.

Some problems are specific for the situation when the TERRALOC MK6 software is running on an IBM AT-compatible computer. A symbol (▦) marks sections of the text that describes these problems.

All error and warning messages that can be displayed in TERRALOC MK6, can be found on-line in the help system (press **<SHIFT> + <HLP>** and select "Error messages"). See also section 9.2.

11.1 GENERAL MK6 PROGRAM PROBLEMS

These errors are generally related to the software.

11.1.1 THE PROGRAM DOES NOT START

There should normally be no problem starting the MK6 program, in the TERRALOC MK6, once it has been installed and runs. However, if the file C:\MK6\SYS\MK6.STS, which contain sall system parameters, has become corrupted, the program might not start at all. When it tries to initialize the system, a general protection fault will generally occur.

If this happens, you can do two things. Either install the MK6 software again (see section 1.7), or delete the following files (you will need an external PC/AT-keyboard):

- C:\MK6\SYS\MK6.STS
- C:\MK6\SYS\MK6.DEF
- C:\MK6\SYS\SESSION.MK6
- C:\MK6\SYS\SESSION.COL

▦

Some requirements must be fulfilled, for the program to run on an office PC/AT-compatible computer:

- CPU: 80386, 80486 (or compatible).
- Co-processor: 80387 (the co-processor is integrated in the 80486DX CPU).
- Display: VGA (640x480 pixels, 16 colours).
- Memory: Min. 2 MB (recommended 4 MB).
- The following directories must exist: C:\MK6, C:\MK6\SYS, C:\MK6\HELP, and C:\TMP.

- The PATH variable (in autoexec.bat) should at least specify: PATH=C:\;C:\DOC;C:\MK6;

11.1.2 GP-FAULT WHEN VIEWING DATA

If the file C:\MK6\SYS\MK6.STS is corrupt, and this affects the view option parameters, it usually results in a GP-fault. The measures to take are the same as for the problem in 11.1.1.

11.2 PRINTER PROBLEMS

11.2.1 COULD NOT LOAD PRINTER MODULE

The printer module (i.e. dynamic link library, .DLL file) for the selected printer could not be found. Printer modules can only be found if they are located in the C:\MK6 directory, i.e. the same directory as the MK6.EXE file.

However, if you start the MK6 program from the C:\MK6 directory, printing can only be performed when the current working directory is C:\MK6.

11.2.2 PRINTER DOES NOT RESPOND

Check the cable connection and that the printer is on-line. The program issues an error message if the printer does not respond, or is out of paper. This will only happen when a printout is initialized. If it happens during a printout, see 11.2.3.

Make sure that you are using a correct destination for the printout (i.e. parallel or serial port).

11.2.3 THE PROGRAM HANGS WHILE PRINTING

It is important that the printer driver selected corresponds to the printer connected. If an erroneous printer driver is selected, either only garbage will be printed, or nothing at all.

When the printer does not respond, due to erroneous printer driver, and the program fails to detect the condition, the program hangs. The only thing to do then, is to switch off the instrument, and then restart it.

Also, if the printer runs out of paper during a printout, there is no way to continue program execution, unless paper is loaded. If you have no paper to load, you have to switch off the instrument and then switch it on again.

11.2.4 PRINTER OUTPUTS GARBAGE

This is probably caused by having connected a printer that does not correspond to the selected printer driver. If so, the printer receives the control codes used for graphics output, and prints this and the graphic data as text, or something completely undecipherable (garbage).

11.3 DATA ACQUISITION PROBLEMS

The data acquisition problems can range from errors in the setting up of the system for measurement, over hardware problems, to errors in the settings in the software.

11.3.1 DEAD CHANNELS

Check the Receiver Spread Menu for the settings of the "Stack On" and "Trace On" parameters. You should also check the reference channel setting in the Receiver Layout Menu.

11.3.2 DATA IS NOT DISPLAYED

Check if you have selected Fast Stack as stacking mode, as this causes data not to be displayed on the screen. In case of, Auto Stack, Preview and Stack Once, check that the "Trace on" parameters in the Receiver Spread Menu are set to ON (i.e. = 1).

11.3.3 LARGE OFFSET

Check offset level and do not worry if it is less than 2000 units.

11.3.4 WRONG CHANNEL ORDER

Either one cable - at least - has been reversed in the layout or the channel assignments are erroneous. Check the cable and/or the channel assignments in the Receiver Spread Menu. Please be aware that a reversed cable can be corrected for in the Receiver Spread Menu.

11.4 TRIGGER PROBLEMS

Correct triggering is essential for the quality of the data from the acquisition, especially when it comes to timing. This means that you should be very careful when selecting triggering method and setting up the triggering system. It may not be always obvious that there is something wrong with the trigger. There are, however, some simple ways to check the functionality of the triggering system, see section 11.4.5.

11.4.1 TRIGGERING TOO LATE (OR EARLY)

This is usually caused by erroneous setting of the trigger sensitivity when analog triggering is used. Adjust the sensitivity level so the trig pulse is detected correctly (see also page 5-19).

11.4.2 SPURIOUS TRIGGERING

This is usually caused by too high trig sensitivity, resulting in triggering on pretrig event noise. Adjust the sensitivity level so the trig pulse is detected correctly (see also page 5-19).

If you are using radio trigging, check also the signal levels of the transmitter and receiver respectively.

11.4.3 UNABLE TO TRIG

The trig sensitivity might have been set too low, or the type of trig input does not agree with the trig method used. Check the trig settings and the trig cable, there may be a break on cable or a bad connection somewhere.

Select "switch" trig input mode (the trig sensitivity should be about 50%) and try to short trig input by a bare wire. The instrument should trig when you make or when you break connection. If the instrument does not trig, then you might have a fault in the internal triggering electronics.

11.4.4 TRIGGERING IMMEDIATELY WHEN ARMING

If you are using analog triggering, the trig sensitivity might have been set too high. At the highest sensitivity level, even internal electronic circuitry noise may cause triggering.

When digital triggering is used (i.e. TTL high or TTL low), you must have the correct setting (high or low) according to the trig signal received. For example, if the trig event is indicated by a logical 1, the trig input type should be set to "TTL high". In this case, the idle trig signal must be a "0" (TTL low), otherwise the instrument will be triggered continuously.

11.4.5 CHECKING THE TRIGGER FUNCTION

There are some means to check the functionality and timing of the trigger system.

11.5 DISPLAY PROBLEMS

11.5.1 THE DISPLAY IS TOO DARK OR TOO LIGHT

Adjust the contrast of the LCD screen. You do so by pressing <SHIFT> + <+> (darker) or <SHIFT> + <-> (lighter).

The LCD contrast is dependent on the temperature.Thus, you must adjust it when moving between different temperature conditions, and when the instrument warms up during operation.

Please note that you can only change the LCD contrast only from the MK6 program.

11.5.2 THIS PROGRAM NEEDS VGA

The MK6 program supports only the VGA graphic mode. If you try to run the program on an office computer that does not have support for VGA, it will not start.

APPENDIX A

C:\MK6\SYS\APPS.LST -   c:\mk6\sys\apps.lst - definition file containing a list of applications that
can be run from the Terraloc Mk6 program.

SYNOPSIS
name,options,directory,commandline;

DESCRIPTION
This file is read and interpreted when selecting "External Applications" in the MK6 program. Each
'name' found in the file is listed in a pop-up menu. The application corresponding to the selected
name is launched by a system call with 'commandline' as argument. The behaviour of this
application can be controlled by 'options' (see below). If 'directory' is a path to a valid directory,
this directory is made the current working directory before 'commandline' is executed. When the
MK6 program regains control, the previous working directory becomes the current working
directory. Even if a directory is not defined, there MUST be at least one character between the
commas at the position for 'directory'.

The directory cannot be on another drive!

The default behaviour when launching an application is; test for presence of a keyboard, run
application, wait for a key to be pressed when returning to MK6 program.

Each line must end with a semicolon and the fields are separated by commas.

OPTIONS
At least one of these options must be present for each definition. Any option overrides the '-'
option. If more than one option is used, they must be separated by at least one whitespace.

-              default execution of application

nokeyb   no external keyboard is needed, return immediately to MK6 program

mouse   mouse is required by the application

EXAMPLES
Call the DOS chkdsk function and return immediately to the MK6 program. No external keyboard
is needed. The chkdsk program is run in the current working directory.

Check Disk,nokey, ,chkdsk;

LIMITS
* Max length of 'name':   63 characters
* Max length of 'options':   63 characters
* Max length of 'directory':   63 characters
* Max length of 'commandline':   128 characters

The maximum amount of conventional memory that is available for use by an external application
is about 465 kilobytes. The amount actually available depends on the number and size of software

drivers and memory resident programs. If the application needs more memory you have to exit the MK6 program and run the application from the DOS-prompt.

SEE ALSO

External Applications in section 4.2.

NOTES

External applications do not have access to the built-in keyboard of TERRALOC MK6. If there is no external keyboard connected, these applications cannot be launched. Only if you have an application that supports the internal keyboard and have defined the *nokeyb* option can it be run from the MK6 program.

APPENDIX B

B. FIRST ARRIVALS FILE FORMAT (*.FIR)

B.1 GENERAL

This is an ASCII text file, containing first arrivals for a record. The file is formatted, so it can be printed on any printer that prints ASCII text. Trace number 1 always start on line 22, and the last trace succeeds by a line containing only dash (-) characters. If you are going to edit this file, be sure to keep the proper format.

Following the format for this type of files, you can of course create new first arrival files manually using a text editor. Be sure however, to save the text in ASCII format and not in any wordprocessing format (e.g. WordPerfect or Microsoft Word).

B.2 DESCRIPTION

<BEGINNING-OF-FILE>
```
1:   Creator: <Instrument - Program version> [Serial number: <xxxxxxx>]
2:
3:   Record:             <record ID>              Date:    <DD/MMM/YYYY>
4:   Sampling interval:  <x.xxx ms>               Time:    <HH/MM/SS>
5:   Number of samples:  <xxxx (xxxx.x ms)>
6:   Delay:              <xxx ms>
7:   Highpass:           <OFF|xx dB/octave, xx cutoff Hz>
8:   Notch:              <OFF|ON>
9:   Digital filters:    <None|Bandpass|Highpass...>
10: [Low|high cutoff:    <xx Hz, xx dB/octave>]
11: [high cutoff:        <xx Hz, xx dB/octave>]
12:
13: ===============================================================
14:
15: SHOT LOCATION:        X = <x.xxx m>  Y = <x.xxx m>  Z = <x.xxx m>
16:
17:
18: RECEIVER LOCATIONS AND FIRST ARRIVALS:
19: ---------------------------------------------------------------
20: Trace      X (m)  Y(m)   Z(m)    First arrivals (ms)
21: ---------------------------------------------------------------
22:  1         x.xxx  x.xxx  x.xxx         x.xxx
23:  2         x.xxx  x.xxx  x.xxx         x.xxx
24:  3         x.xxx  x.xxx  x.xxx         x.xxx
     .     .      .      .      .             .
     .     .      .      .      .             .
     .     .      .      .      .             .

     .     .      .      .      .             .
21+N:  N     x.xxx  x.xxx  x.xxx         x.xxx
22+N: ----------------------------------------------------------------
```
<END-OF-FILE>

<xxxx> represents a value
[xxxx]   denotes optional text
| delimits possible values

B.3 EXAMPLE OF FIRST ARRIVALS FILE

Example B.1   First arrivals file.

Creator: TERRALOC Mk6 - Version 2.11

Record:	000010	Date:	16/APR/1993
Sampling interval:	0.100 ms	Time:	17:06:10
Number of samples:	2048 (204.8 ms)		
Delay:	0 ms		
Highpass filter:	Off		
Notch filter:	Off		
Digital filter:	None		

SHOT LOCATION: X = 0.000 m   Y = 0.000 m   Z = 0.000 m

RECEIVER LOCATIONS AND FIRST ARRIVALS:

Trace	X (m)	Y (m)	Z (m)	First arrivals (ms)
1	1.500	0.000	0.000	2.400
2	4.500	0.000	0.000	8.800
3	7.500	0.000	0.000	11.600
4	10.500	0.000	0.000	14.000
5	13.500	0.000	0.000	15.200
6	16.500	0.000	0.000	16.800
7	19.500	0.000	0.000	20.000
8	22.500	0.000	0.000	21.200
9	25.500	0.000	0.000	23.200
10	28.500	0.000	0.000	23.600
11	31.500	0.000	0.000	24.800
12	34.500	0.000	0.000	27.200
13	37.500	0.000	0.000	28.800
14	40.500	0.000	0.000	30.400
15	43.500	0.000	0.000	30.800
16	46.500	0.000	0.000	30.400
17	49.500	0.000	0.000	30.400
18	52.500	0.000	0.000	31.200
19	55.500	0.000	0.000	32.000
20	58.500	0.000	0.000	32.800
21	61.500	0.000	0.000	33.600
22	64.500	0.000	0.000	33.600
23	67.500	0.000	0.000	34.000
24	70.500	0.000	0.000	33.600

APPENDIX C

C. TERRALOC MK6 FORMATTED SETTINGS FILE (*.MK6)

C.1 GENERAL

This is an formatted ASCII text file. It contains some important information about the settings of the systems. Settings files can be saved and read in the measure menu (see section 5.9 and 5.10). Additionally, the user can select to have a settings file saved each time a record is saved (see page 8-3). This way, there are formatted, ready to print files, that can be used in a report, on how the records were acquired.

If you are going to read the contents of a settings file (load set, in the measure menu), you should not tamper with the contents of the file. This may cause the file to become corrupt. Reading a corrupt settings file does not damage the system, but will result in restoring most settings to default values.

Example C.1 shows a typical settings file.

C.2 EXAMPLE OF SETTINGS FILE

Example C.1   Example of TERRALOC MK6 settings file.

TERRALOC Mk6 - Version 2.11   [Nov 04 06:15:16 1992]

File: 000010.MK6

Sample interval: 250 µs
Number of samples: 1024
Number of stacks: 0
Delay time: 0 ms

Acquisition highpass filter

Filter status: OFF
Slope: 12 dB/octave
Cutoff frequency: 12 Hz

Notch filter: OFF

Number of channels: 24

Trace No.	Chan No.	Pola-rity	Stack on	Trace on		Trace No.	Chan No.	Pola-rity	Stack on	Trace on
1	1	1	1	1		13	13	1	1	1
2	2	1	1	1		14	14	1	1	1
3	3	1	1	1		15	15	1	1	1
4	4	1	1	1		16	16	1	1	1
5	5	1	1	1		17	17	1	1	1
6	6	1	1	1		18	18	1	1	1
7	7	1	1	1		19	19	1	1	1
8	8	1	1	1		20	20	1	1	1
9	9	1	1	1		21	21	1	1	1
10	10	1	1	1		22	22	1	1	1
11	11	1	1	1		23	23	1	1	1
12	12	1	1	1		24	24	1	1	1

Referencechannel: 0
Sourcetype: UNTITLED
Receivertype: UNTITLED
Tracetype: UNTITLED

APPENDIX D

D. GEOPHONE TEST REPORT FILE FORMAT

D.1 GENERAL

Results of each geophone test are stored on disk, in a formatted ASCII text file. This file contains the serial number of the instrument that performed the test, the date and time the file was created, some parameter statistics, and the parameters for each geophone tested.

The statistics information gives mean, min, max, and standard deviation, for the maximum amplitudes and resonance frequencies.

The pattern of the filename is: GTxxxxxx.RPT, where GT = geophone test, xxxxxx = current record number, and RPT = report. It should be noted that, if several tests are made on the current record number, only the last test will be saved in the report file.

Maximum amplitude

This is the maximum amplitude of the geophone response to the test signal. Usually it is the first peak.

Resonance frequency

The resonance frequency is calculated from the half period of the peak containing the maximum amplitude.

Damping

The program calculates the damping of the geophone, according to (D.7).

$$b = \frac{\ln\left(\frac{A_1}{A_2}\right)}{\sqrt{\pi^2 + \left(\ln\left(\frac{A_1}{A_2}\right)\right)^2}} \qquad (D.7)$$

This equation describes the damping response to a step function. A_1 is the first peak to peak amplitude, based on the position of the maximum amplitude of the signal, A_2 is the second peak to peak amplitude, and b is the damping (which is dimensionless).

Notes

In this field, the program makes some annotations about the status of each geophone, based on the results of the geophone test.

- *N/A*, means that the program could not determine if a geophone was properly connected. Thus, you should check this geophone.
- *Reference* (valid only for channel 12 and 24), means that this channel has been re-directed to the reference channel connector.
- *a '*'* at the value of either the max amplitude or resonance frequency columns (or both), means that the value seems abnormal, i.e. deviates from the mean value. There is a condition that the program cannot resolve.

D.2 EXAMPLE OF GEOPHONE TEST REPORT FILE

Example D.1   Geophone test report file.

TERRALOC MK6 Ver 2.1 S/N: 9326601   [Nov 03 16:18:20 1993]

File: C:\SEISDATA\930908\GT100191.RPT

Number of traces: 24

Max amplitudes

Mean: 944210
Sdev: 97992
Min :   487322
Max :   985205

Resonance frequencies

Mean: 10.33 Hz
Sdev: 4.69 Hz
Min :   9.55 Hz
Max :   30.21 Hz

Trace	Channel	Max amplitude	Resonance freq. (Hz)	Damping	Note
1	1	954025	9.87	0.41	
2	2	955011	9.75	0.39	
3	3	948765	9.91	0.42	
4	4	950682	10.08	0.42	
5	5	950195	9.62	0.45	
6	6	960233	9.80	0.38	
7	7	958285	10.26	0.37	
8	8	949100	9.70	0.45	
9	9	985205	9.98	0.40	
10	10	960281	10.20	0.40	
11	11	974092	10.34	0.41	
12	12	964858	9.55	0.42	
13	13	949078	9.94	0.41	
14	14	958761	9.91	0.39	
15	15	487322	30.21*	0.16	N/A
16	16	972165	10.11	0.40	
17	17	968029	9.83	0.43	
18	18	957555	9.79	0.42	
19	19	982610	9.93	0.42	
20	20	976192	9.89	0.45	
21	21	969716	9.96	0.40	
22	22	981193	10.02	0.39	
23	23	977481	9.78	0.38	
24	24	970199	9.82	0.43	

APPENDIX E

E. ERROR MESSAGES

Assertion failed ...

> A fatal condition has been discovered by the software. Please note the text in the dialogue box and contact ABEM.

>> ABEM Instrument AB
>> BOX 20086
>> S - 161 02 BROMMA
>> SWEDEN
>>
>> PHONE: (+46) 8 764 60 60
>> TELEFAX: (+46) 28 11 09
>> TELEX: 13079 ABEM S

Can't copy files onto same directory

> The target directory must be another than the source directory.

Can't delete "name", possible read only

> For some reason it is not possible to delete the file "name". The most probable cause is that the file is read only.

Can't open help file

> The help file containing the context of the selected help has been deleted, renamed or moved to another directory, so it can't be found by the help system.

Can't remove ROOT directory

> The current working directory is the root directory of the drive. There was an attempt to remove this. The root directory can not be deleted.

Couldn't create directory "name"

> A directory with this name can't be created. The directory already exists or there might be a file with the same name.

Couldn't load the printer module

> The dynamic link library containing the module for the current printer cannot be found. There are two reason to this. Either does the file not exist or the MK6 program was started from the directory C:\MK6.

Couldn't open file for reading/writing of ...

> A general file error has occurred while opening a file for reading or writing.

Couldn't set real-time clock correctly

> The real-time could not be set to the chosen date and time values. Try once again.

Data in memory. Can't do geophone test

> When there are data in the stack memory, the geophone test cannot be performed. Save the data or clear the stack memory before doing the geophone test.

Didn't recognize the dataformat

> The Mk6 program does not support the data format of the current SEG-2 file.

Directory "name" is not empty

> A directory cannot be removed if it contains subdirectories or files. All contents of the directory must be deleted before deletion of the directory.

Directory or File "name" already exists

> The name used to create a new directory is already in use in the current directory. This may be either another directory or a file.

Disk is write protected

> Your disk drive has returned an error which may be due to a faulty disk or drive, or the disk may be write-protected. Try another disk or remove the write-protection.

> Disks are usually write-protected with good reason. Always check the disk's contents before formatting it, or deleting the contents. Note that some disks do not have a write-protect notch which means that they are permanently write-protected. If this is not the problem, contact ABEM.

Drive "?:" is not ready

> The diskette is not correctly inserted in the drive, or the drive door is still open.

Error accessing: "name"

It was not possible to access a file when attempting to open it.

Error accessing new target path: "path"

It is not possible to change to the selected target directory.

Error formatting disk

An error occurred during formatting of a floppy disk. The disk may be write protected or is damaged so it can't be formatted.

Error reading from disk

An error occurred during reading operation from disk due to a track error. The disk may have become corrupted.

Error writing to disk

There is an error on the disk you are writing to or there may be a problem with the disk drive itself.

Try another disk. If the problem remains, contact ABEM.

External keyboard failure This application requires ...

When running most programs from the "External Applications" menu, a external keyboard is needed. This error message indicates that the MK6 program has not been able to identify a external keyboard. This means that the keyboard is not connected or it is not compatible with the system.

Faulty/ambiguous roll-along parameters have been changed

There was an incorrect setting of start trace, end trace and trace step, eg the start trace was greater than the end trace. In case of this error, the program makes an attempt to correct the faulty parameters. You should always check in the Receiver Layout Menu if the new settings are correct.

File "name" is empty

You tried to view an empty file. This file should be deleted.

File "name" is too long

The "View Textfiles" command can only view files that are smaller than 64 kilobytes.

Fatal error during file copy

A serious error has occurred during a read or write operation to disk when copying files. This should never occur under normal circumstances.

File seek error

The disk drive being accessed was physically unable to move its read/write heads to the requested location. This generally means a disk controller hardware failure.

General date/time specification error

There was something wrong with the set date and time values. Try to set date and time once again.

General failure accessing disk

Your disk may have returned an error which may be due to a faulty disk or drive. Try another disk (if you are formatting a removable disk) or contact ABEM.

General memory allocation error

A fatal error occurred when allocating memory. Restart the program. You should also inform ABEM that this error occurred.

General Protection Fault Detected

The CPU has detected a general protection violation. This should normally never occur. General protection faults caused by software bugs are usually found before release. The most probable cause is that a settings file is corrupt or that there is some interference with other programs or drivers.

One solution is to reinstall the MK6 software. Proceed as follows:

1.   Switch off the instrument.
2.   Insert the MK6 software disk.
3.   Switch on the instrument.
4.   Remove the disk.
5.   Switch on the instrument once more.

The installation program removes all created settings files and copies default config.sys and autoexec.bat files to the system. All necessary program files are also copied.

Help file not found

The help system could not find the appropriate help file. Check that all help files are installed in the C:\MK6\HELP directory. If needed, copy all help files from the installation disk to the C:\MK6\HELP directory or reinstall the complete software package.

Insufficient memory

The memory allocation routine couldn't find any more free memory. To free up some memory, you can try to:

- display data more compressed, e.g. 8 sample per pixel
- decrease the number of samples

Although the program supports virtual memory, you can still run out of memory. The virtual memory requires free space on disk and if there is no sufficient free disk space, memory allocation of virtual memory will fail.

Internal disk drive error

The current diskdrive has reported an internal hardware error. You should check the integrity of the disk.

Invalid date specification

The specified date value was incorrect.

The correct format is MM/DD/YYYY where MM is month (1-12), DD is day (1-31) and YYYY is year (1901-2059).

Invalid time specification

The specified time value was incorrect.

The correct format is HH:MM:SS where HH is hours (0-24), MM is minutes (0-59) and SS is seconds (0-59).

Invalid date and time specification

Both the specified date and time values were incorrect.

The correct format of the date is MM/DD/YYYY where MM is month (1-12), DD is day (1-31) and YYYY is year (1901-2059).

The correct format of the time is HH:MM:SS where HH is hours (0-24), MM is minutes (0-59) and SS is seconds (0-59).

NN invalid definitions found and rejected

A number of invalid definitions were found in the external applications definition file. Check the syntax of all entries in the file C:\MK6\SYS\APPS.LST.

No application definition file found.

> To open up the "External Applications" menu, there must be a file called APPS.LST in the
> directory C:\MK6\SYS. The contents of this file is used to define the external applications that can
> be run from within the Mk6 program and their behaviour.

No data found in "name"

> The datafile "name" was found but contained no data.

No files marked for copy

> No source files has been marked for copy. Mark files in the source box by pressing ENTER or
> SPACE on the selected file(s). Press CTRL+ENTER to mark all files in the source directory, or
> CTRL+BACKSPACE to unmark all files.

No files marked for delete

> No files has been marked for delete. Mark files in the source box by pressing ENTER or SPACE
> on the selected file(s). Press CTRL+ENTER to mark all files in the source directory, or
> CTRL+BACKSPACE to unmark all files.

Not enough memory to allocate stack space

> The system ran out of memory while allocating space for the stack. Disable decimation sampling if
> you are using this. If this is not enough, decrease the number of samples you use.

Not enough selectors available

> A message from the DOS-Extender, that it has run out of selectors. It can't allocate any more
> memory.

Out of disk space

> There is no more free space on the current disk. If the hard disk is full, remove files that you no
> longer need. If the floppy disk is full, insert a new disk.

Out of memory

> The program has run out of free memory. This usually means that there is not enough free space
> on the harddisk to use the virtual memory manager. Delete some files that you don't need any more
> and try again.

Printer does not respond. Check cable connection ...

> The printer does not respond on commands sent. Check that:
>
> - the cable is correctly connected
> - the printer is not out of paper
> - the printer is on-line

Received TRIG signal caused Noise Monitor to stop

> When the instrument is not in armed mode and the noise monitor is running (command <Show noise>), the noise monitor cannot handle a incoming trig signal. If a trig is detected, the noise monitor stops immediately. It can however be restarted.

Settings file "name" is corrupt

> The contents of the selected setting file are corrupt and cannot be read properly. Default settings are selected by the system.

Sector not found

> The requested sector on the disk is not present or is corrupt. With diskette-drives, this usually means that the diskette in the drive has not been formatted.

There are no data in the stack

> An attempt was made to save a record, but there were no data in the stack memory.

This application requires a mouse

> Some external applications might require a mouse to work properly. This is set by a parameter in the EXTAPPS.LST file. If a mouse is required, the application can't be run if the Mk6 program has not recognized and initialized a mouse.

Time shift exceeds record length. Zero shift set by system

> The selected time shift in the View Options Menu exceeds the record length. To assure proper function of the display of the record, the program sets the time shift automatically to zero.

Too few/many traces written to file

> The number of traces actually written to the datafile did not agree with the expected number of traces. However, the format of the datafile is still correct.

Too long pre-trig time selected ...

> The selected pre-trig time selected was longer than the actual record length. As a safety measure, the pre-trig time is automatically set to zero.

Too long delay time selected ...

> The selected delay time selected was longer than the maximum possible delay. As a safety measure, the delay time is automatically set to zero.

Transfer of data from memory board has been interrupted ...

> The transfer of acquired data from the acquisition memory boards to the stack memory has been interrupted. The data found in the stack memory most probably corrupt. Clear the stack and re-measure the current record.

Unable to initialize help system

> The content of the current help file has been changed, or there is not enough free memory to create the help structure.

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ABEM Instrument AB
TERRALOC MK6 SYSTEM

Reference Manual Update
for Software Version 2.21, October, 95

ADDENDUM

Table Of Contents

5

1. INTRODUCTION

This Manual Update contains information about the new TERRALOC MK6 software Version 2.21. In this document the emphasis has been laid on changes and additions to the earlier program releases.

Besides the addition of new features, there are some differences in the operation compared to earlier versions. We believe, however, that these differences will have made the operations easier and better.

The first change you will notice is the installation software. Now the built-in keyboards of TERRALOC MK6 can be used in the installation process and this gives you better possibilities to customize the software installation.

Another important change is that the program is started from a batch file (MK6.BAT) in the directory C:\MK6. This, in combination with the program's exit codes, makes it possible to have the instrument to restart in case of abnormal behaviour.

Other important new features include crosscorrelation that makes it possible to perform processing of vibration seismic records, and removal of last shot from the stack.

IMPORTANT!   Read Chapter 2 "Installing the TERRALOC Mk6 Software" and, Chapter 3 "Notes" before you begin installing the new software.

2. INSTALLING THE TERRALOC MK6 SOFTWARE

Read this _whole_ section before proceeding with the installation.

2.1 Installation Notes

With the release of this version of the TERRALOC MK6 software, a new installation program is introduced.

The installation program used to install ABEM TERRALOC MK6 SOFTWARE, _INSTALL_, is based on licensed software provided by Knowledge Dynamics Corp, P.O. Box 780068, San Antonio, Texas 78278 (USA). _INSTALL_ is Copyright (c) 1987-1993 by Knowledge Dynamics Corp which reserves all copyright protection worldwide. _INSTALL_ is provided to you for the exclusive purpose of installing ABEM TERRALOC MK6 SOFTWARE. ABEM Instrument AB has modified the software as provided by Knowledge Dynamics Corp, and thus the performance and behavior of the _INSTALL_ program shipped with ABEM TERRALOC MK6 SOFTWARE may not represent the performance and behavior of _INSTALL_ as shipped by Knowledge Dynamics Corp. ABEM Instrument AB is exclusively responsible for the support of ABEM TERRALOC MK6 SOFTWARE, including support during the installation phase. In no event will Knowledge Dynamics Corp provide any technical support for ABEM TERRALOC MK6 SOFTWARE.

2.2 General

The new installation program can make use of the built-in keyboards of TERRALOC MK6. It is also possible to install the TERRALOC MK6 Software on any harddisk, not only C:. It cannot be installed on a floppy disk.

The LCD contrast can be adjusted in the installation program by pressing **<SHIFT>+<+>**, or **<SHIFT>+<->**.

Table 2-1 shows how the TERRALOC MK6 keys are used in the installation program.

2.3 Installation

To install the software with an external keyboard connected, proceed as follows:

1. Insert the disk labelled _Disk 1_.

2. Type _A:INSTALL_ and press **<ENTER>**.

To install the software using the TERRALOC MK6 built-in keyboards, proceed as follows:

1. Insert the disk labelled _Disk 1_.

2. Switch off the instrument and switch it on again to boot from the installation disk.

When version 2.21 has been installed there is a third way to install the software or coming updates. The default external application definition file, APPS.LST, contains a definition to run the installation program.

1. Insert the disk labelled _Disk 1_.

2. Go to _External Applications_ under _File_ in the Main Menu.

3. In the field *Application*, open the list by pressing **<SPACE>**, select *ABEM Terraloc Mk6 Installation* and go to <Ok> and press **<ENTER>**.

During the installation you are prompted to select some options. If it is the first time you install version 2.21, you should select the **Standard Installation** option and also install the default CONFIG.SYS and AUTOEXEC.BAT files. It is also recommended that you enables the Virtual Memory Manager, especially if you have less than 8 MB of RAM installed in your instrument.

NOTE! If you have made any changes to **CONFIG.SYS** or **AUTOEXEC.BAT**, or have a SCSI interface installed, it is better to use the *CUSTOMIZE* option at installation. You should also <u>not</u> select to install default CONFIG.SYS and AUTOEXEC.BAT files. However, in this case you have to make one change to the AUTOEXEC.BAT file. The call to *MK6* should be replaced with the following: *CALL MK6.BAT* (see also Example 2-1).

Example 2-1   An example of AUTOEXEC.BAT for Terraloc Mk6. Please note the line CALL MK6.BAT. This is necessary to start the program when switching on the instrument.

```
ECHO OFF
PATH C:\DOS;C:\;C:\MK6;
SET TMP=C:\TMP
PROMPT $p$g
CALL MK6.BAT
ECHO ON
```

Table 2-1   Important keys in the installation program.

TERRALOC MK6	Function
↑ ↓ ← →	Moves the cursor.
SPACE	Toggles choice (Yes/No).
+	Sets all choices to "Yes". Selects Y when prompted for (Y/N).
-	Sets all choices to "No". Selects N when prompted for (Y/N).
ENT	Continues execution with selected choices.
ESC	Aborts installation.
SHIFT +	Increases LCD contrast.
SHIFT -	Decreases LCD contrast.

2.4 Keyboard

In the TERRALOC MK6 program, there are some new mappings between the built-in keyboards and AT-compatible keyboards. The complete mapping is shown in Table 2-2. This table lists mainly those mappings where there is a difference between the two types of keyboards.

2.5 Reset System

It is possible to reset and re-initialize all system parameters from the new TERRALOC MK6 program. In the Main Menu press **<CTR>+<0>**, and answer <Yes> if you really want to do this. This causes all system status files to be deleted and the instrument to be rebooted.

Table 2-2   The mapping of keys between the TERRALOC MK6 built-in keyboards and external AT-compatible keyboard.

TERRALOC MK6	AT-Compatible Keyboard
HLP	F1
ARM	F2
SAVE	F3
PRN	F4
SHIFT+BACKSPACE	Del
SHIFT+SPACE	Ins
SHIFT+DOWN	Page Down
SHIFT+UP	Page Up
SHIFT+LEFT	Home
SHIFT+RIGHT	End
SHIFT+HLP	Shift+F1
SHIFT+ARM	Shift+F2
SHIFT+SAVE	Shift+F3
SHIFT+PRN	Shift+F4
CTR+HLP	Ctrl+F1
CTR+ARM	Ctrl+F2
CTR+SAVE	Ctrl+F3
CTR+PRN	Ctrl+F4
CTR+ESC	Alt+Esc
CTR+TAB	Ctrl+Tab
CTR+DOWN	Ctrl+Down
CTR+UP	Ctrl+Up
CTR+LEFT	Ctrl+Left
CTR+RIGHT	Ctrl+Right
CTR+• (DOT)	Ctrl+Ins

3. NOTES

3.1 Setting Files

3.1.1 \MK6\MK6.INI

This file replaces the previous setting file C:\MK6\SYS\MK6.STS which was saved on exit from the MK6 program. The new file is also stored on exit, except that it is in (readable) ASCII format. It uses a safer format than the old MK6.STS file. The MK6.INI file is similar to the INI-files used in Microsoft Windows.

When the MK6 program starts, this file is loaded and parsed and if any statement cannot be interpreted correctly, default values will be used instead.

3.1.2 \MK6\SET*.SET

The previous *.MK6 files have been partially replaced by the *.SET files. It is still possible to save the settings in formatted *.MK6 files - simultaneously with the saving of a SEG-2 record - but they cannot be read. The *.MK6 files can be printed as sort of protocol of the performed measurements and included in a report.

The *.SET can be saved and loaded in the *Measure/File* menu. These files are similar to the MK6.INI file, except that the user can select the parameter groups that should be saved (see *5.1.1.6 Setting File Setup, page 14*).

All *.SET files are located in the C:\MK6\SET directory. They cannot be saved or loaded if located anywhere else. This makes it easier to save predefined setups and keep track of general setups.

3.2 Disk Cache Programs

The disk cache program - SMARTDRV.EXE - included in MS-DOS shipped with the TERRALOC MK6 should not be used. There is a conflict between SMARTDRV and the hardware of TERRALOC MK6.

Typical is that SMARTDRV.EXE causes a General Protection Fault when the instrument is armed and receives a trigger signal.

It is recommended that you, if you want to use a disk cache program, try Norton's NCACHE2.EXE instead (included in Norton Utilities 7.0). This program has not been thoroughly tested yet but it seems to be working.

3.3 LCD Contrast

When the instrument has been switched off for a while the display might become dark (or bright) when it is switched on again (e.g. due to temperature differences). In extreme cases it might be hard to actually see that it is working correctly with a very dark/bright display.

NOTE! If the display is completely dark or bright you should always try to adjust the contrast before you assume that something is malfunctioning. Use <+> and <-> in the Main Menu to adjust the contrast, <SHIFT>+<+> and <SHIFT>+<-> in all other menus.

4. FILE MENU

4.1 File Manager

In the new version of the MK6 program the current working directory does not change when selecting source directory in the File Manager. Every time you start the File Manager, the source directory will be set to the current working directory.

4.2 Change Directory

To change to a new working directory you have to use *Change Directory* in either the *File Menu* or any of the *File pop-up menus* in the *Measure-* or *View Data Menus*. The working directory is displayed in the Version line of the screen.

4.3 External Applications

The default definition file for External Applications comprises six program items, i.e. predefined command lines.

All programs are run in the current working directory unless otherwise defined.

Sometimes a system diagnosis may be required - e.g. when installing third party software - in which case it can be useful to run the programs: PharLap Tellme, System Diagnostic, and System Summary.

4.3.1 Item: ABEM Terraloc Mk6 Installation

Runs the Terraloc Mk6 installation program *from floppy disk*. Use this when receiving new versions in the future, or when doing reinstallations.

4.3.2 Item: Memory Statistics

Runs the MS-DOS MEM program in the current directory.

> Output file: MEM.LOG

4.3.3 Item: MS-DOS Edit

Runs the MS-DOS editor. An external keyboard must be connected.

4.3.4 Item: PharLap Tellme

Runs the program TELLME.EXE supplied with the DOS-Extender. It analyzes the CPU, BIOS, DOS, memory map and protected mode functions.

> Output file: TELLME.LOG

4.3.5 Item: System Diagnostic (MSD /P)

Runs the program MSD.EXE included with Microsoft MS-DOS. It provides you with detailed technical information about the computer in your TERRALOC MK6.

> Output file: SYSTEM.LOG

4.3.6 Item: System Summary (MSD /S)

The same as *4.3.5 Item: System Diagnostic (MSD /P)* but creates only a system summary.

> Output file: SUMMARY.LOG

4.4 DOS Shell

No changes from Version 2.12.

4.5 Restart Program

This menu choice terminates the program and returns exit code 127 to MS-DOS. If the program was started from the batch file MK6.BAT (supplied by the installation), the computer will be rebooted and the program restarted.

4.6 Exit codes

There is always an exit code returned from the program on exit. This exit code reflects the status of the program at the time of exit. Table 4-1 lists the available exit codes.

Table 4-1   The exit codes of the TERRALOC MK6 program.

EXIT CODE	COMMENT
0	Program successfully executed.
1-19	Reserved for use by user. Can be used to launch external applications.
31	An error occurred during startup of program. Execution impossible.
99	An assertion failed. (Assertions are seldom used in the program, usually during development only)
70	Out of memory while trying to save a record to disk.
101	Integer divide by zero.
102	Stack overflow.
103	General protection fault.
104	Floating point error.
105	An error occurred in the user interface.
127	The user terminated execution and the instrument will be restarted

4.6.1 Exit codes: 1-19

The exit codes 1-19 are somewhat special as these codes are reserved for use by the owner of the instrument. They can be used to start external applications. In the file C:\MK6\SYS\APPS.LST you define the application as usual, but instead of a command line you enter the exit code you would like to use. When you select this definition as an application to run, the MK6 program exits with the exit code defined in C:\MK6\SYS\APPS.LST.

NOTE!   Please remember that the file APPS.LST is always replaced by the default APPS.LST on installation. Therefore, if you have added something to APPS.LST, you should make a backup copy of your old APPS.LST before starting the installation.

4.6.2 Exit codes: 20-63

For the exit codes from 20 to 63, the program is terminated and returned to DOS and further execution is not possible. These exit codes are usually returned if something happens during startup, or if the program cannot be started properly.

4.6.3 Exit codes: 64-128

For the exit codes from 64 to 128, the program is terminated and further execution is not possible. If the MK6 program was started by use of the MK6.BAT file (located in C:\MK6, placed there by the installation program) the instrument is restarted (the computer is rebooted).

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5. MEASURE MENU

There are many changes and additions to the Measure Menu. Mainly it is the File and Noise functions that have been affected.

There is a new item - Record Log - which makes viewing and management of the record log file easier.

5.1 Measure

In this release of the software there are some new direct key-commands:

- **<CTR>+<SAVE>:** saves data to disk without updating any parameters or resetting stack memory. Use this for intermediate saving of data when you do not want to risk to lose data, e.g. due to a power failure. To update the next record, press **<SAVE>**.

- **<CTR>+<UP/DOWN>:** Increments and decrements the record number when the instrument is not armed, and no data is present in memory. When data are present in memory, pressing these keys instead affects the individual trace scaling (if it is enabled).

- **<BACKSPACE>:** deletes the last shot from the stack. It works in all stacking modes. Before the shot is deleted, you have to verify the action. If the instrument is in armed mode, it is disarmed before deleting the last shot from the stack..

- **<CTR>+<1>:** opens the Receiver Spread Menu.

- **<CTR>+<2>:** opens the Sampling Parameter Menu.

- **<CTR>+<3>:** opens the Receiver Layout menu.

- **<CTR>+<4>:** opens the Analog Filter Menu.

- **<CTR>+<5>:** opens the Text Menu

- **<CTR>+<6>:** opens the Trig Input Menu

- **<CTR>+<7>:** opens the Trig Output Menu

- **<CTR>+<8>:** opens the Noise Monitor Menu

5.1.1 File

The *Measure/File* Menu is completely new. In its layout, it is similar to the *View/File* Menu. The *Measure/File* Menu contains three more items ("Settings File Setup", "Load Settings" and "Save Settings").

The *File* Sub Menu is accessed by pressing **<ESC>**, **<1>** or by selecting *"1 File"* and pressing **<ENT>**.

5.1.1.1 New

New works like "Clear and Reinitialize Record" in the *Tools* command.

5.1.1.2 Open

Opens an existing record and reads the contents.

If you arm the instrument while having opened a record this way, you will first be asked if you want to continue stacking on the record already opened.

5.1.1.3 Save

The same as pressing **<SAVE>**.

5.1.1.4 Save As

Opens a dialog where you can enter a filename of your choice. If you select <Ok>, data is saved to disk using this filename. This function always checks for already existing files and prompts the user before overwriting.

5.1.1.5 Change Directory

Change current working directory (same as Change Directory under File in the Main Menu).

5.1.1.6 Setting File Setup

Select which parameters (i.e. parameter groups) should be saved by item <8> *Save Settings*. For more information about setting files, see *10* Setting Files *page 23*

5.1.1.7 Load Settings

Load the contents of a selected setting file.

5.1.1.8 Save Settings

Save the current settings to file according to the mask defined in "Setting File Setup".

5.1.1.9 File Manager

Opens the file manager.

5.1.1.10 Close

Closes the Measure Menu. Before doing so, the program checks that there are no unsaved data in memory.

5.1.2 Settings

5.1.2.1 Sampling Parameters

Pre-stack Corr.

In the Sampling Parameters Menu one menu item has been added. It is the *Pre-Stack Corr.* which can take the values *Yes* or *No*. When it is *Yes*, data are correlated before adding to stack. Each trace is (cross-)correlated with the selected reference trace.

The correlation reference trace can only be selected when pre-stack correlation is enabled.

NOTE! When the pre-stack correlation is used, it is not possible to return to the data actually recorded. The data saved in the record will be the correlated data.

5.1.2.2 Analog Filters

No changes from Version 2.12.

5.1.3 Arm/Trig

No changes from Version 2.12.

5.1.4 Noise

5.1.4.1 Threshold Alert

In the Noise Menu there is one new item: *Threshold Alert*. The threshold alert can take on two values, *Off* and *On*.

The actual threshold level is set by pressing **<+>** or **<->** in the amplitude mode of the noise monitor.

When the Threshold Alert is set to *On* and the noise monitor is in amplitude mode, the program checks incoming data before data is added to the stack. If the pre-trigger noise exceeds the threshold level the user is warned that the noise may be (too) high. The user is asked if data should be added to the stack. However, data will never be displayed before it is added to the stack. It is still possible to Delete Last Shot (see page 16).

5.1.4.2 Attenuation

This is the menu item previously called *Monitor Damping*. The attenuation ranges from 0 dB to 96 dB. At 0 dB the sensitivity of the noise monitor corresponds to the maximum sensitivity of Terraloc Mk6 input signals and at 72 dB the maximum amplitude will fit within the noise monitor window in amplitude mode.

The attenuation value of 96 dB is typically used when high noise signals are present and the Noise Monitor is Full Waveform ("waterfall") mode.

5.1.4.3 Noise Display In Armed Status

In earlier versions of the program, it was only meaningful to use the noise monitor in the Stack Once and Fast Stack modes as the noise was displayed when the instrument was in armed status.. There has been a small change to the functionality of the noise monitor to circumvent this.

When the noise monitor is enabled, it will display the noise whenever you press <ARM>. It does not matter which stacking mode you are using.

For example, if you are using Auto Stack, the first time you press <ARM> the noise is displayed until a trigger event is detected. After the data has been stacked it is displayed and the instrument is automatically put into armed status. The noise, however, will not be displayed unless you press <ARM> again.

5.1.5 Display

See 6.1.2.5 Display, page 18

5.1.6 Tools

5.1.6.1 Automatic Receiver Spread

No changes from Version 2.12.

5.1.6.2 Automatic Receiver Geometry

No changes from Version 2.12.

5.1.6.3 Geophone Test

When the geophone test is selected, a menu is opened. In this menu you slect the *Lowest Expected Geoph. Freq.* This means that you select the sampling interval and number of samples combination that gives optimum performance of the geophone test regarding the geophones used.

Please note that the results are not true resonance frequency and damping. They are rather apparent values. The damping usually comes close to the true values, but the frequency may differ up to about 10%. The result is true to the extent that it is possible to single out a geophone which differ from the rest of the geophones or a geophone that does not work.

If a channel does not show any response, you should first check all connections and that the geophone is planted properly in the ground. If this does not solve the problem, try another (fully functional) geophone before discarding the (possibly) erroneous geophone.

Select <Ok> to actually perform the geophone test.

5.1.7 Clear

No changes from Version 2.12.

5.2 Record Log

5.2.1 View

Views the contents of the Record Log File on the display. If the file is bigger than 64 kB it cannot be displayed. The information saved in this file comprises: Record (File) name, Date and time when the record was saved, and where it was saved. For example:

000185.SG2 was saved:Tue Nov 28 13:25:16 1994 on C:\SEISDATA\SP1_2

5.2.2 Status

Displays the current status of the Record Log File. The information displayed is; complete path and filename, number of entries in the file, actual filesize in bytes and last date and time of modification.

5.2.3 Delete

Deletes the Record Log File and creates a new fresh file. All entries are lost. Before you delete this file, it would be good practice to make a copy of it.

The Record Log File should be deleted regularly as it grows in size with every record saved to disk. A good idea would be to delete the file when its size exceeds 64 kB as it can no longer be displayed in MK6 program.

5.2.4 Exit

Exits this menu.

5.3 Actions

5.3.1 Delete Last Shot

After a shot has been added to the stack, it is possible to delete that shot from the stack. If you press <BACKSPACE>, you will be asked if you would like to delete the last shot. If you answer "Yes", the shot is subtracted from the stack.

Delete Last Shot works in all stacking modes.

5.3.2 Preview Stack Mode

The preview stack mode has been changed in its performance. As previously it waits for either an accept of the last shot or a trigger event for the next shot. However, if you accept a shot the stacked data are displayed after the shot has been added to the stack.

6. VIEW MENU

6.1 View Data

6.1.1 Quick File Menu

When a directory contains many files (e.g. >50 files) it takes a considerable time to list these files in the conventional "Open File" menu. Additionally, it will take some action before you have found the desired file. However, if you press **<CTR>+<0>** in the View Data Menu, you will get access to a so called Quick File Menu.

In the Quick File Menu, you only have to enter the record number of the desired file.

Please note, however, that if you use the built in keyboards of TERRALOC MK6, you may only enter purely numerical record numbers. With an external keyboard you can, of course, use any valid characters.

If you have purely numerical filenames (record numbers), you can increment/decrement by pressing **<+/->**.

There is also a field for selecting a prefix. you do this by either entering the prefix (1 or 2 characters) or press **<SPACE>** to access a list with predefined values.

6.1.2 Commands

There have been some changes to the commands in the View Data Menu.

6.1.2.1 File

New

Clears the memory of current record.

Open

Reads a record (file) from disk and displays it in the trace window. If you move to another directory to get a record you will return to the current working directory after opening the record. If you know the record number, use the Quick File Menu.

Save

Save the current record using the current name. The record is saved in the current working directory.

Save As

Same as above. You get a possibility, however, to change the filename used when saving the record on disk.

Change Directory

Selects the current working directory.

Merge Records

Appends the contents of a selected record to the current record.

The records merged must be of the same length, i.e. equal sampling interval and equal number of samples.

The pre-trig/delay times should also be equal. If they are <u>not</u> equal you will get a warning but the files will still be merged. Correct information about pre-trig/delay times are kept in the file for each trace according to the SEG-2 format specification. However, when data are displayed in the MK6 program, the time values are only correct for traces

Close

Closes the view data after checking that data have not been changed (i.e. processed).

6.1.2.2 Zoom

No changes from Version 2.12.

6.1.2.3 Spectrum

No changes from Version 2.12.

6.1.2.4 Arrivals

No changes from Version 2.12.

6.1.2.5 Display

Display Mode

Two new display modes have been added; Normalize All and Normalize Limit.

Normalize All works like Normalize but searched all traces for the maximum to use for scaling.

Normalize Limit uses the parameter Trace Size (see 6.1.2.5 Trace Size) to limit the maximum amplitude used for scaling. Thus, with Normalize Limit selected and the Trace Size set to for example - 24 dB, all amplitudes greater than this value will be discarded for the scaling process.

Linearity Range

The Linearity Range is now measured in percent. 100 % corresponds to the dynamic range of TERRALOC MK6. This value refers to the maximum input signal of TERRALOC MK6.

Trace Size

The Trace Size is now measured in decibels and refers to the maximum input signal of TERRALOC MK6.

Window Function

The Window Function selection is new to this version. It defines which windowing function that should be used for the amplitude spectrum display.

The list of windowing functions comprises: *(None), Hanning, Welch, Cosine Tapered 75 %, and Cosine Tapered 90 %.*

6.1.2.6 Filter

The Digital Filter Menu has a new design. The bandpass, highpass, lowpass and band reject filters have been integrated into a single menu, called *Frequency Reject.*

Frequency Reject

Filter Type

There are four available choices for the butterworth digital filters: *Bandpass, highpass, lowpass and band reject.*

Low Cut-Off Freq.

Frequencies below this value will be rejected.

Low Filter Slope

The slope of the lowcut side of the filter.

High Cut-Off Freq.

Frequencies above this value will be rejected.

High Filter Slope

The slope of the highcut side of the filter.

α–β Filter

No changes from Version 2.12.

Remove DC-Offset

No changes from Version 2.12.

Correlation

The Correlation item comprises functions for auto- and crosscorrelation. The Autocorrelation correlates - as its name implies - each trace with itself. The crosscorrelation correlates each trace with a selected reference trace. When you are doing the crosscorrelation, you can also set how long the resulting correlated trace should be (1/1, 1/2, 1/4, 1/8, or 1/16).

Unfilter Data

No changes from Version 2.12.

6.1.2.7 Velocity

No changes from Version 2.12.

6.1.2.8 Print

No changes from Version 2.12.

6.1.2.9 Swap

No changes from Version 2.12.

6.1.2.10 Settings

No changes from Version 2.12.

6.2 View Geophone Report

No changes from Version 2.12.

6.3 View Text Files

No changes from Version 2.12.

6.4 View Options

See 6.1.2.5 Display, page 18

7. PRINT MENU

No changes have been made from Version 2.12.

8. BATCH MENU

8.1 Digital Filters

Most of the filters available in 6.1.2.6 Filter (page 18) are accessible in this menu.

In this menu you can select a filter and its parameters. When this has been done you select the files (SEG-2 records) that the selected filter should be applied to.

9. SYSTEM MENU

9.1 Setup

In the System Setup Menu there is one change. It is the item Power Save, that has been given some new choices. Now it can take three values: *Off, On Exit and Auto*.

As previously, its status does only affect the power supply to some of the TERRALOC specific electronics.

Off: No power saving function is enabled.

On Exit: The power saving function will switch off some of the power to the electronics when exiting the program.

Auto: The power saving function will switch off the power to the electronics whenever it is possible. For example, when you leave the Measure Menu.

9.2 Date & Time

No changes have been made from Version 2.12.

9.3 Serial Communication

This command opens a pop-up menu in which the settings for the serial ports can be defined. TERRALOC Mk6 supports one serial port (COM1:). However, as the software can be run on any PC-compatible computer, there is the possibility to change the settings for four serial ports.

9.4 Color Palette

The Example Box in the color palette follows the current item in the colors list. This makes it easier to visualize what item the selection will apply to.

9.5 LCD-1

This is a default color setting for use with monochrome (grayscale) LCD displays.

9.6 LCD-2

This is a color setting for use with monochrome (grayscale) LCD displays that in some light conditions might work better.

9.7 External Monitor

This is a default color setting for use with devices capable of displaying colors, e.g. external CRT monitors, TFT displays etc.

10. SETTING FILES

10.1 *.MK6 Files

In earlier versions (before ver. 2.21) of the MK6.EXE program settings could be saved and loaded in the current working directory with filename extension ".MK6". From version 2.21 it is only possible to save the settings in formatted textfiles (extension ".MK6") when saving data to disk (by selecting "Store Settings On Save" in the System Setup Menu).

10.2 *.SET Files

With the release of version 2.21 of the MK6.EXE program a new settings file has been created which can be saved and restored by the user. The filename extension of this file is ".SET" and these files are always saved in the directory C:\MK6\SET. As all setting files are stored in one directory they are all accessible from whatever directory is the current working directory.

The *.SET files are managed in the Measure Menu submenu <1 *File*>. There are three "commands"; Setup, Save and Load.

In the Setting File Setup Menu you can select which parameter groups that should be saved in the setting file. Examples of parameter groups are; *System* (parameters from the System Setup Menu), *Sampling* (parameters from the Sampling Parameters Menu), and *Layout Geometry* (parameters from the Receiver Layout Geometry Menu). Using this menu you can create setting files for display options, layout geometries, etc.

The Save Settings command uses the current status of the Setting File Setup to save the specified parameters.

The Load Settings command reads the selected setting file. This command however, does not take into account the Setting File Setup, it reads all contents of the selected setting file.

11. INDEX