INSTRUCTION FOR CPT-LOG SOFTWARE

(CPT Data Acquisition & Presentation Software, version 5.xx)

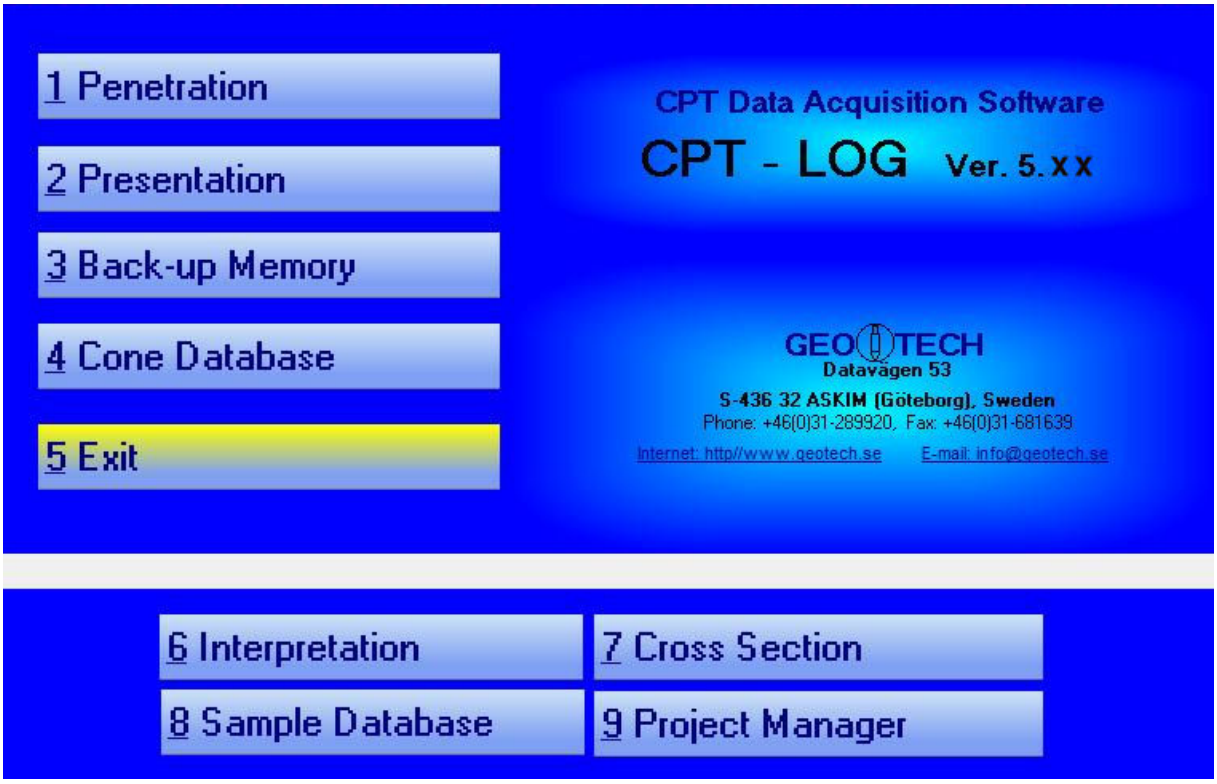

Fig. 1-1: First screen display of CPT-LOG (Options 6 to 9 are activated in case CPT Interpretation program CPT-PRO (from Geosoft) is loaded. Demonstration versions of both software can be downloaded via the Geotech web site http://www.geotech.se/)

GEOTECH

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Ingenjörsfirman Geotech AB

Datavägen 53
S-436 32 ASKIM
SWEDEN

Ph: +46 - 31 28 99 20
Fax:+46 -31 68 16 39
E-mail:info@geotech.se
Web site: http://www.geotech.se

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1 INSTALLATION

1.1 BASIC INFORMATION

The CPT-LOG software is activated by CPTLOG.EXE and consists of four modules operated from the same shell. These modules are:

1. **[PENETRATION]** for logging CPT soundings and storing CPT data with Geotech CPT systems.
2. **[PRESENTATION]** is used for making graphical presentations and printing out recorded CPT soundings of Geotech or other manufacturers' files. The module is activated by CPTGL.EXE. The files can be converted to standardised digital formats. The module is activated via a thumbnail browser (THUMB.EXE).
3. The third module is a **[Back-up Memory]** tool for emptying the CPT sounding data stored down hole in the cone back-up memory (optional) during up to eight hours of soundings. This new set of data is then synchronized with depth information and a new CPT file generated.
4. The fourth module is a **[Cone Database]** for storing the characteristics of the user's cones. The cumulated number of sounding meters since the last calibration for all stored cones is automatically calculated and the number of meters left to the next one is displayed.

The present software is built as a database using Borland BDE. In case you already have Borland BDE installed on the computer, the minimum version should be 5.0 in order to avoid incompatibility problems.

1.2 HARDWARE AND OPERATIVE SYSTEM REQUIREMENTS

The hardware requirement for this software is a Pentium™ PC computer with minimum 16 MB RAM. The software runs under Windows 95/98/2000/NT™/XP™ and is a fully 32bit program.

1.3 PROGRAM INSTALLATION

WARNING: The software should always be installed locally and not via a server. This may cause the hang up of the server.

1. Insert the CD-ROM with CPT-LOG installation files to CD drive.
2. The Auto run option should start the installation software automatically. It may happen that specific computer settings might block the Auto run procedure. In such case run install.exe manually – by executing it in the START/RUN menu, after locating the file in the CD drive.
3. After starting the installation software, the existence of HASP (Hardware Against Software Piracy) device drivers and of copies CPT-LOG v. 4.09 software will be checked automatically. Then a [Install CPT-LOG] window with info about status is opened.
4. Click <Next> and set proper installation options, below
5. If no HASP driver is installed or if the HASP drivers are older than the current version, the default setting will be <Reinstall>. In any other case, the default setting is
< Do not install>.
6. If CPT-LOG software is installed, then the default option is <Don't install>, if not installed, the default option is <Install>. In case an older version is identified, <Reinstall> is an option.

7. In case HASP drivers and/or CPT-LOG are already installed, the option <Reinstall> is available.
8. Set the above installation options and click <Next>.
9. The default installation is recommended, particularly when the software is installed for the first time.
10. Restart the computer after the installation is completed.
11. In case the HASP driver was not successfully installed, do it manually by clicking on the Hdd32.exe file on the CD-ROM. This will install the HASP driver ver 5.22 or download the latest version at: http://ealaddin.com. Go to Support & Download, HASP, Select HASP for End-Users, Latest HASP Device Driver and download HDD32.zip

The following panel (Fig. 1-6) allows the user to choose the type of installation. Any installation requires as a minimum of modules, while the other modules are optional: Presentation module, the manual as *.pdf and Log Files, used by Geotech in assisting users when troubleshooting. These files will store all data transmission.

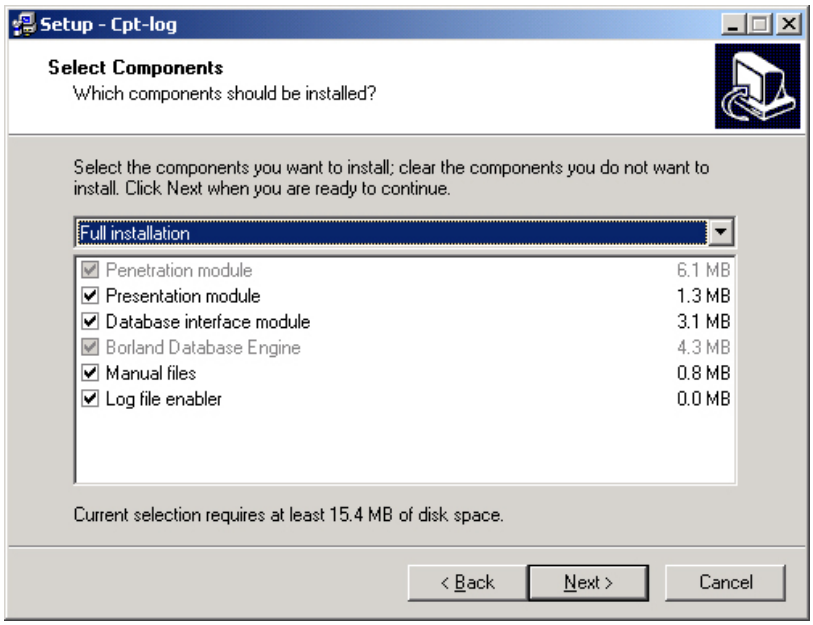


Fig. 1-6: Installation options

WARNING. Installation onto a computer with WINDOWS NT/2000/XP operating system should be performed by a user with administrator competence.

Running the software

1. CPT-LOG is protected with a hard lock. Available hard locks are 1.) LPT (plugged into printer port) and 2.) USB hard lock plugged into USB port. Before running CPT-LOG the protection key must be properly installed, see above.

WARNING. When you use Windows NT/2000/XP operating system, before removing the hard lock from computer it is necessary to [Stop device] like other hardware using icon with green arrow on right down corner.

WARNING. [Penetration] module uses cone parameters stored in Cone database. Therefore it is necessary to have minimum one cone saved in database before running [PENETRATION].

1.4 ADDITIONAL INFORMATION

In the case of communication problem with the CPT equipment, make certain that the COM Port definition is the same under BIOS Setup and under “My computer”: Click System Properties, Hardware and check Resources of the two Com Ports (generally 3F8 for COM1 and 2F8 for COM2). Under Port installation, the parameters should be as follows: Databits = 8, Parity = None and Flow control = None.

When installing the program on computers without COM ports but with USB ports. Buy a COM port/USB port adapter and go to My Computer, then System Properties, Hardware and check Resources of the USB ports. Change the Indata&Outdata/Interval setting for the USB port you wish to use by inactivating the “Use Automatic Settings” to get the following setting 03F8-03FF. The port will be redefined as COM1 when you reboot your computer.

2 CONE DATABASE

This is a tool to simplify the sounding procedure. After purchasing any new cone or after calibrating them, fill in or update the cone parameters, i.e. the measurement ranges, geometrical specifications, scaling factors etc in the Cone Database (Fig. 2-1). Thereafter, when starting a CPT sounding, choose the given cone from the list of probes you have stored and the data will be loaded automatically.

To enter a new probe of Classic type click on "Add new probe" and then in the “New Cone” window (Fig. 2-2) enter the serial number and a name for the Cone. The probe number is engraved on the end piece of the probe. To enter a new probe of Nova type you can do it the same way as a classic cone or you can do it by connecting the probe to the computer using USB and click on "Add new probe". Then you can read the serial number from the probe by clicking “Read from cone”. Then for both types of probes fill in all specifications from your calibration sheet, delivered together with the probe. It is important that you don’t mix Classic and Nova cones in the cone database. The database will not work properly in that case.

In addition, the cone database provides you with the total number of meters of soundings achieved with the chosen probe and the remaining meters until the next calibration is recommended.

You can set two different probe types depending on what kind of probe and transmission system you use. The two options are: Nova cone and Classic cone, with or without memory.

If you will setup a Nova probe with memory the probe must be connected to the computer with the memory read out unit (Lemo – USB cable).

From the Cone Database it is possible to add a new cone, to edit a previously defined cone (e.g. when you change the scaling factors after a new calibration), to create cone reports or to view the service schedule.

Note:

1. Information about the cones is taken from the database (the most important ones are the number of the cone and the scaling factors). Therefore it is necessary to fill Cone Database before first running Penetration and Presentation modules.
2. The Cone Database should be the same in your office computer (for Presentation module) and in the field computer (Penetration module). It is sufficient to create the database files once (they are created in DATA folder) and then copy all of them to DATA folder in other computer.
3. The Data connected with soundings are automatically added to the database after each test. To have full control on cones, we recommend to update the database files (by copying database files from field notebook to office desktop) just after each CPT project.
4. If you have used an earlier version of CPT-log before, you need to update all cones in the cone database regarding probe type (transmission mode and memory).

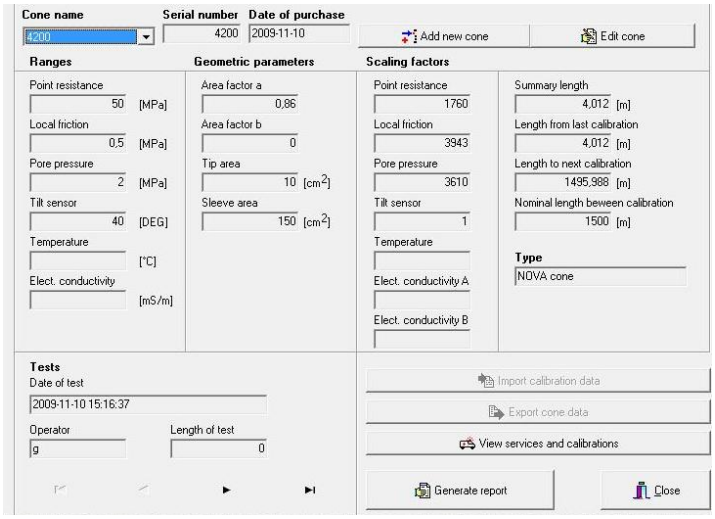


Fig. 2-1: Cone data base showing the specifications of the chosen probe

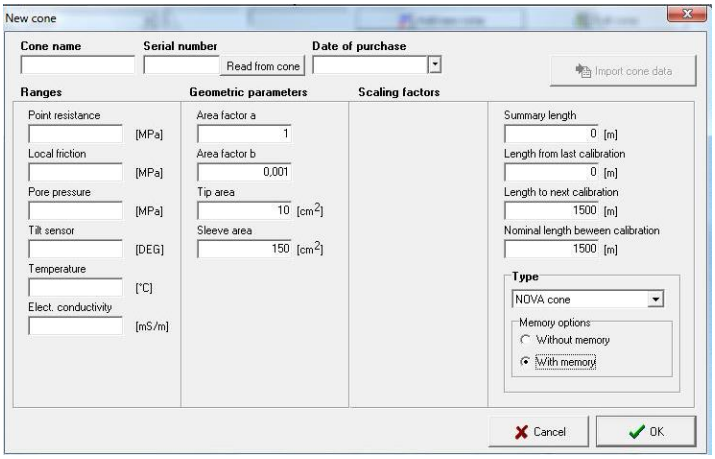


Fig. 2-2: The window where you add a new cone.

3 PENETRATION

In order to perform a CPT sounding run CPT-LOG.EXE software and choose "1 Penetration" menu (Fig. 1-1). After activating the software the application window will appear (Fig. 3-1). A flow-chart of a CPT sounding is shown in Graph 1.

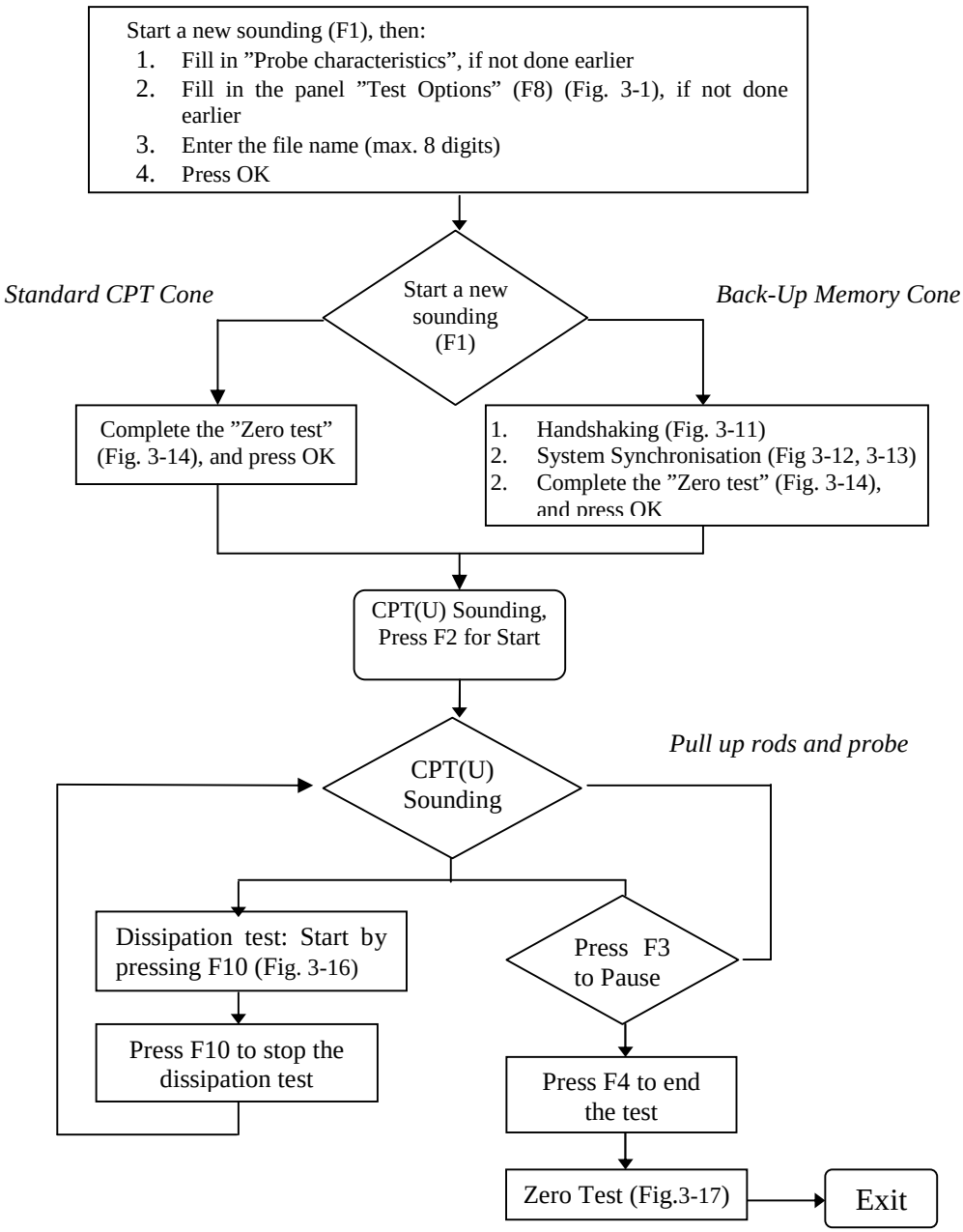
Fig. 3-1: Application Window CPT-LOG (Penetration). The field right of CPT Status will be flashing green when communication with the probe is on, red with an error message

3.1 BEFORE PROBING

Press ”Penetration”, Fig. 1-1

Before a New Sounding

1. Verify COM port setup (Shift+Ctrl+F1) (Fig. 3-3)
2. Verify Probe characteristics (F7) (Fig. 3-4)
3. Set View Options (F5) (Fig. 3-5)
4. Set Ranges (F6) (Fig. 3-6)
5. Set Dissipation sampling intervals (Shift+Ctrl+F3) (Fig. 3-7)
6. Choose whether to display Flags (Shift+Ctrl+F5) (Fig. 3-8)
7. Choose Other Colours (Shift+Ctrl+F4) (Fig. 3-9)
8. Fill in Test Options (F8) (Fig. 3-1) before after Start of test



Graph 1: Probing with CPT-log software

The Bar Menu (Fig. 3-2) consists of [Files], [Options], [Notes] and [About]. Under [Files], the user can exit (Ctrl+X), under [Options], all settings for Penetration are set, [Notes] is presently inactivated as the new Flag function is introduced with this CPT-LOG version (Fig. 3-8). Under [About], the user can access the present manual as a pdf file. The file can be updated with more recent files from Geotech but it is paramount that it is saved in the same directory C:\Program\Geotech\Cpt-log\Manual

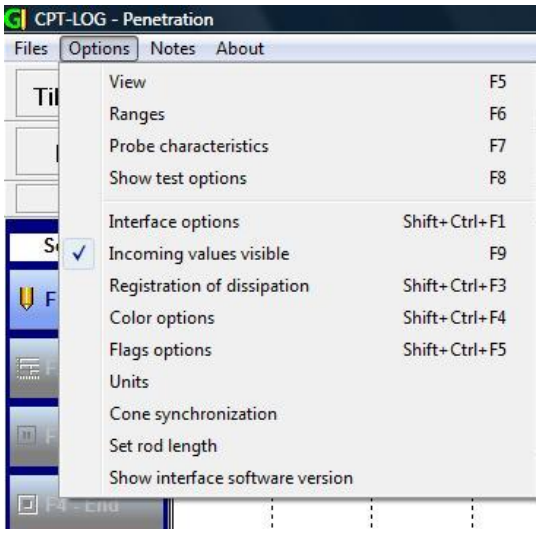


Fig. 3-2: Options Menu

1. Set serial port choosing menu Options – **Interface** options - Shift+Ctrl+F1 (Fig. 3-3), COM1 in most cases.

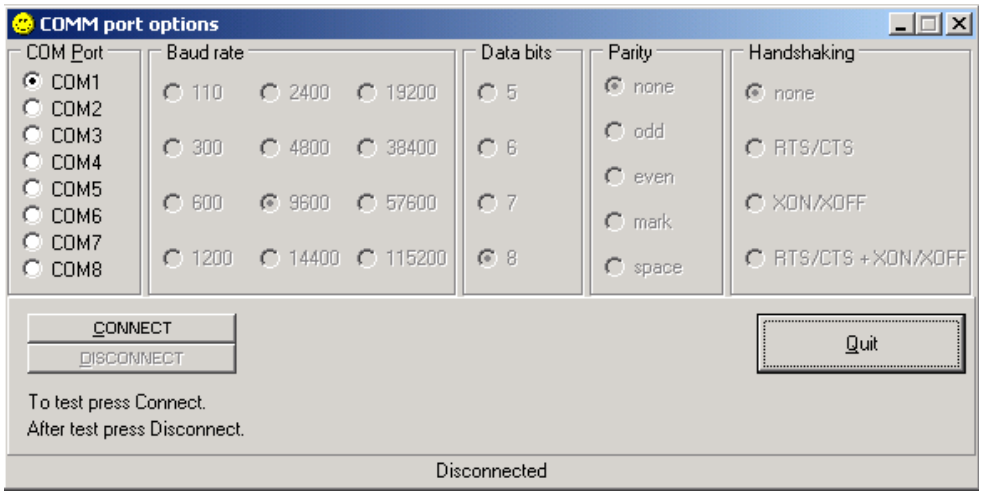


Fig. 3-3: Common Port options, Press Shift+Ctrl+F1

2. Check the probe parameters – under Options menu, choose **Probe characteristics** – F7 (Fig. 3-4). Factor “a” is generally around 0.58 – 0.62 and “b” around 0.014. These characteristics are saved in the "Cone Database".

3. Set view parameters from selected channels from menu Options – **View** – F5 (Fig. 3-5). One to four channels can be displayed simultaneously. The parameters are:
   - Point resistance (Qc, MPa): Not corrected for pore pressure effect
   - Local friction (fs, MPa): Not corrected for pore pressure effect
   - Dynamic pore pressure (u, MPa)
   - Friction ratio (Rf = f_s/q_c, %)
   - Friction ratio (Rf = f_T/Q_T, %)
   - Tilt angle (TA, degrees)
   - Electric conductivity (Ec, mS)
   - Temperature (t, ^oC)
   - Penetration speed (Vp, cm/s)
   - Battery regulated voltage in the cone (only for Nova cones)

The user can choose between meters of feet as depth unit.

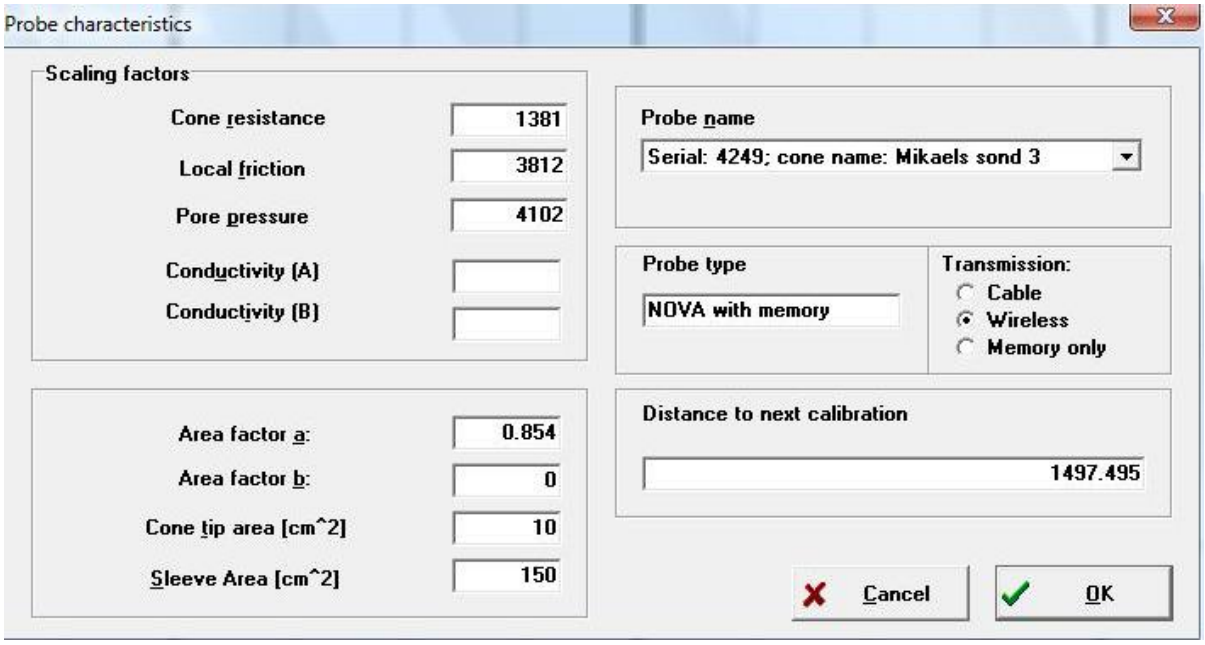


Fig. 3-4: Probe characteristics, press F7

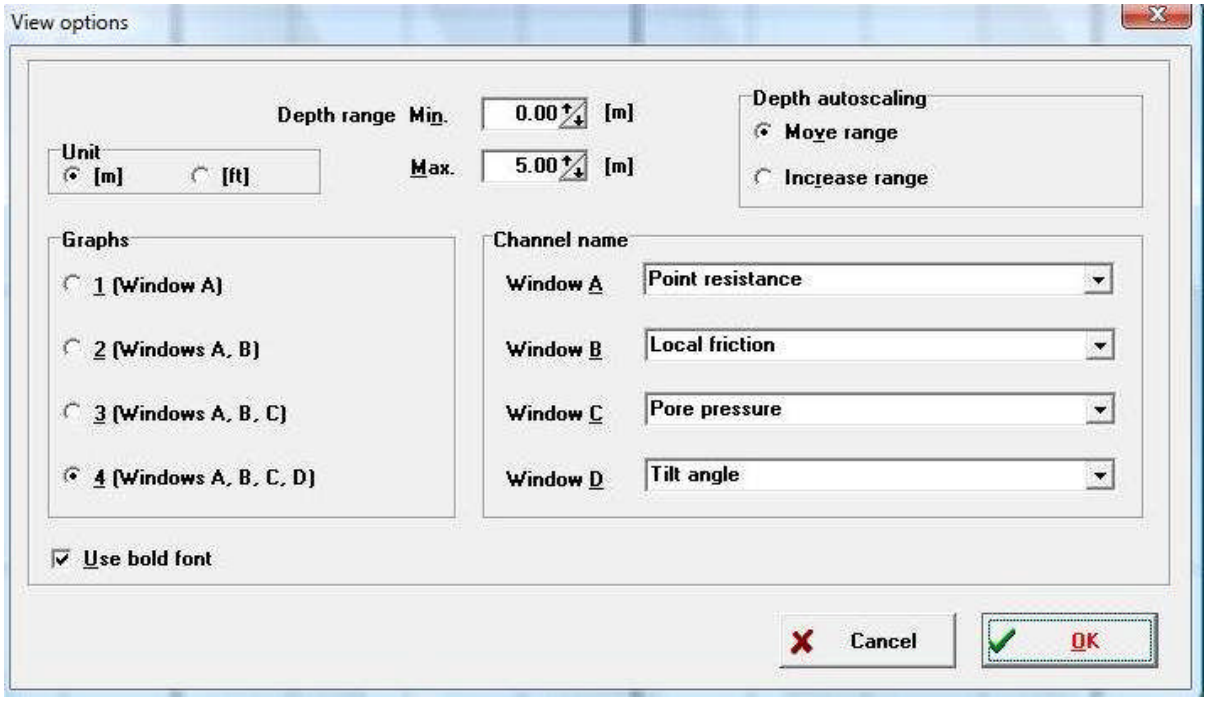


Fig. 3-5: Panel View, Number and type of graphs displayed; Depth range, Autoscaling, Depth unit in meters of feet, Press F5

4. Adapt channel ranges, if needed, from menu Options – **Ranges** – F6 (Fig. 3-6). The smaller value, level 1 (default), the second bigger, level 2 – set automatically if values from range 1 are exceeded.

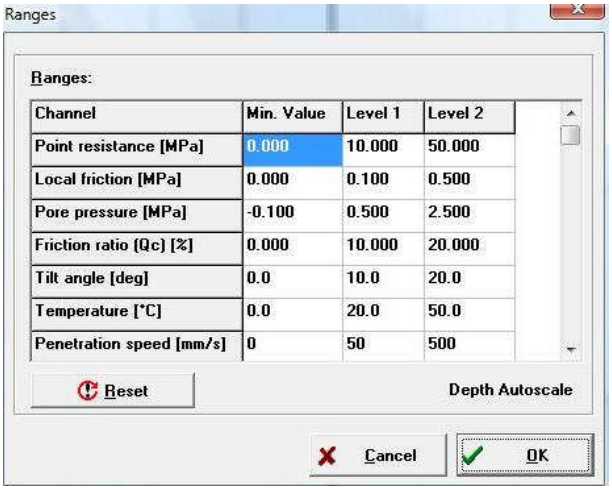


Fig. 3-6: Ranges, Press F6

5. In case dissipation tests are planned, go to Options- **Registration of dissipation** – Shift+Control+F3 (Fig. 3-7) and set the acquisition parameters. If long tests are to be carried out, longer registration intervals after the first minutes will dramatically reduce the size of the file.

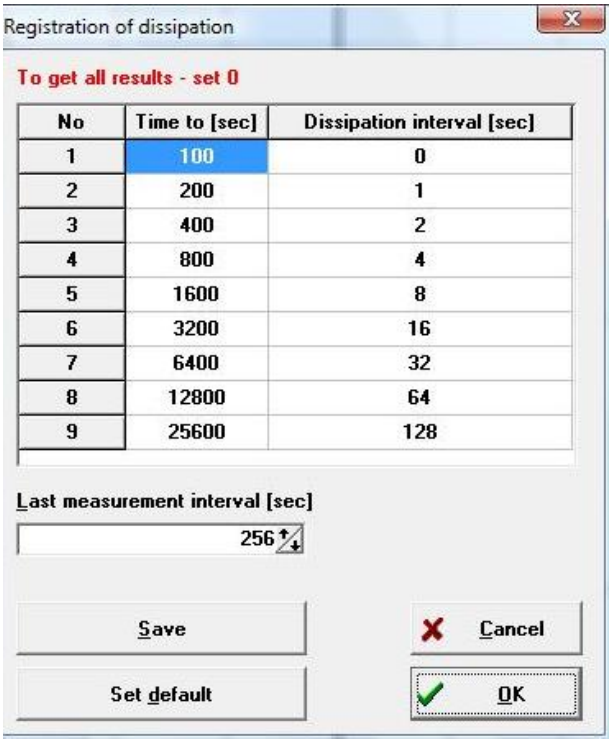


Fig. 3-7: Dissipation Test, Acquisition Parameters, Press Shift+Ctrl+F3

6. Another feature in CPT-LOG are **Flags Options** (Fig. 3-8) informing the CPT data interpreter of any artefacts, such as tilt alarm (may have generated lateral loads and erroneous point resistance values), point resistance alarm, transmission loss, unchanged depth causing spikes in the data (dissipation of the pore pressure or low point resistance and friction values) because of rod extension or breaks in the sounding. The user can define his own flags and whether to display these during the sounding.

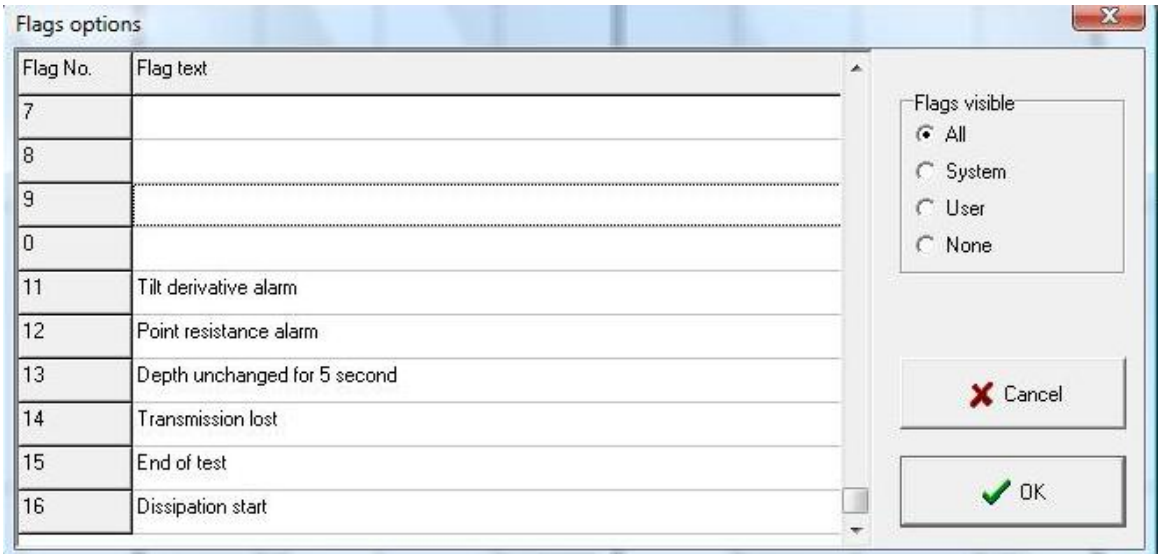


Fig. 3-8: Flags, Press Shift+Ctrl+F5

7. The colour settings on the screen can be changed (Fig. 3-9)

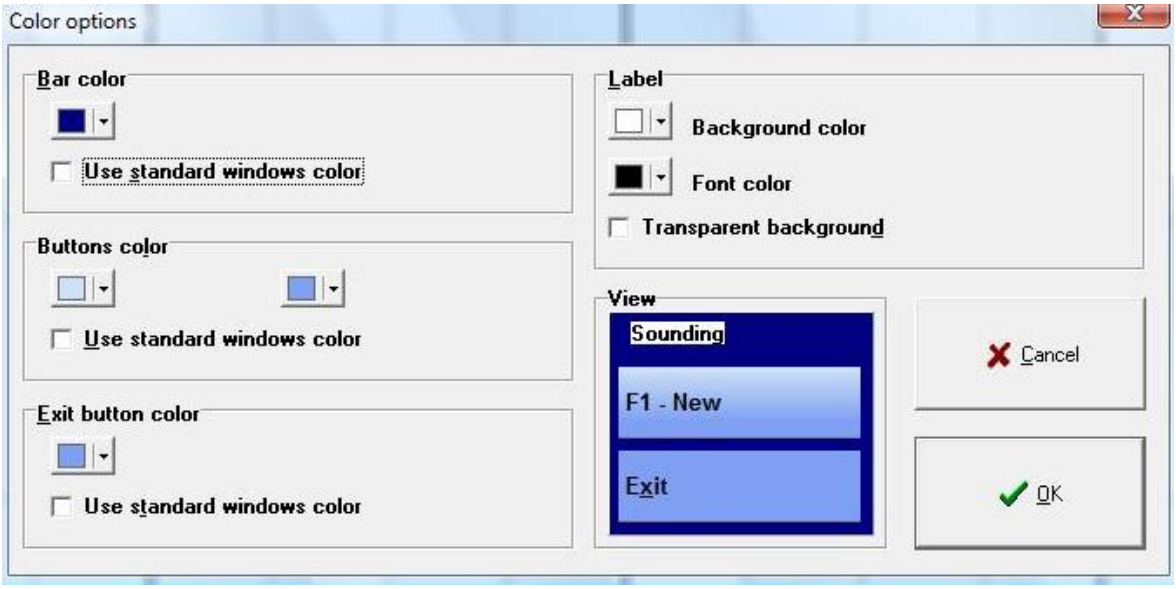


Fig. 3-9: Color Options, Press Shift+Ctrl+F4

UNDER SHOW TEST OPTIONS **- F8 (FIG. 3-1), ALL SOUNDING INFORMATION IS INPUT EITHER PRIOR TO THE SOUNDING OR WHEN PRESSING NEW F1, SEE 3.2**

8. PENETRATION. Logging options is set to the international standard of 20 mm measuring interval or smaller (the theoretically smallest interval with cordless transmission and four channels is 14 mm).

   The location can be defined as X and Y coordinates, as Road section and as Geographical coordinates. Road section locations are used for instance by the Swedish Road Authority, where the location is defined by a section number and right and left offsets from a central line.

   An alarm function can be started, triggered by a maximum point resistance (Qc) value and/or a maximum tilt angle derivative degrees per meter. A value around 75 degrees/m, i.e. 0.75 degree/cm can be chosen but depends on local conditions. Then press OK.

   Note: The tilt derivative will trigger very easily before the cone is stabilised in the ground. This is not a cause for alarm but of observation as a cone can be bent even in surface gravel provided the push force is sufficient.

3.2 PENETRATION

1. Press **New** – F1.
2. Probe characteristics will appear (Fig. 3-4).
3. The Test Options will appear (Fig. 3-1). Fill in as described under 3.1 Before Probing, 8 - Under Show Test Options.

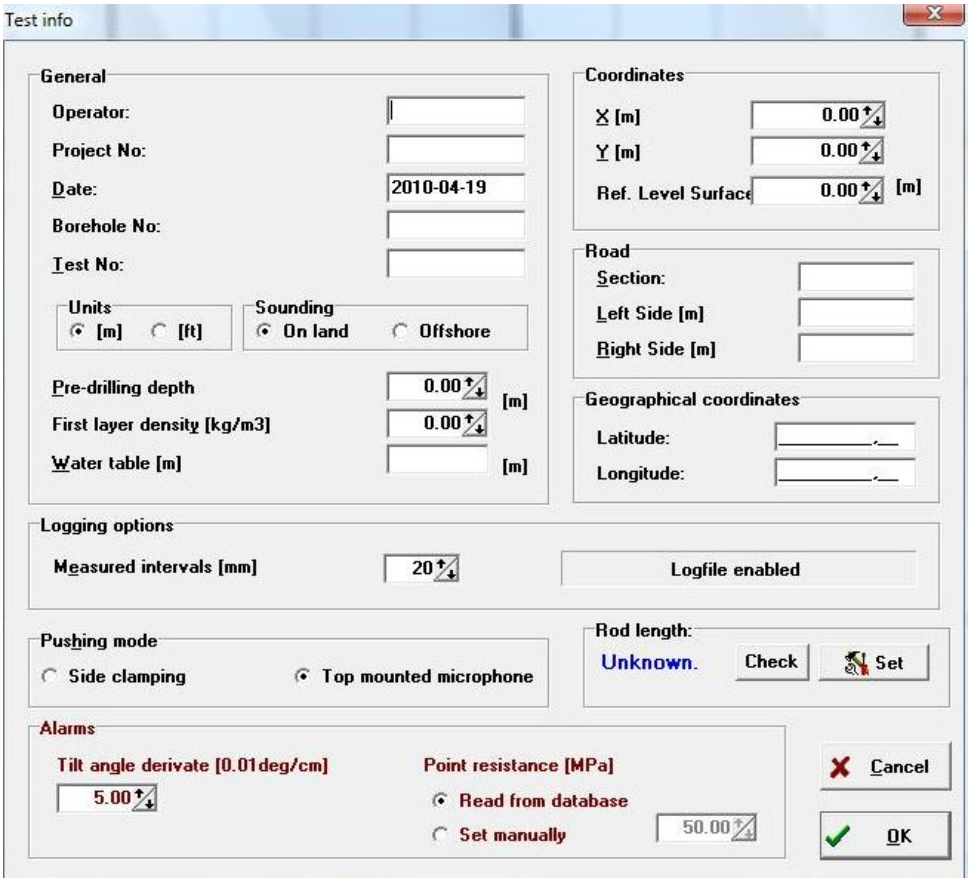


Fig. 3-10: Show test options, Press F8

4. Enter the file name, maximum 8 characters and press OK.

5. When using a Nova or Classic cone without memory, the software goes directly to a Zero Test (Fig. 3-14), see below.

5.1 When using a Classic cone with memory, the CPT system with the cone and CPT Interface box and software will start with a handshaking (Fig. 3-11) and a synchronisation of the cone and the CPT Interface box and software (Fig. 3-12). When completed (Fig. 3-13), the Zero Test panel appears (Fig.3-14).

5.2 When using a Nova cone with memory, the software goes directly to a Zero test (Fig. 3.14). If warning shows that a synchronization was made along time ago, connect cone to the computer with USB cable and go to Penetration → Options →Cone synchronization (Fig. 3.2)

6. In the Zero Test (Fig. 3-14), the three values should be around 400 units on the first row for Classic probes and around 12800 for Nova probes.

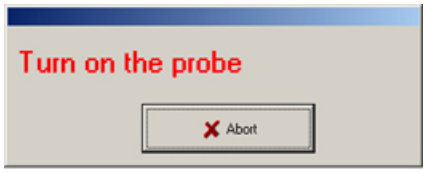


Fig. 3-11: Hand shaking of probe and CPT Interface box and CPT-LOG software

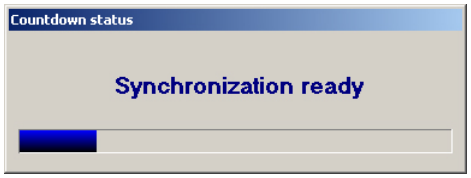


Fig. 3-12: When this sign appears the synchronization has been made successfully

Fig. 3-13: Synchronisation of Back-up cone and CPT Up hole System ready

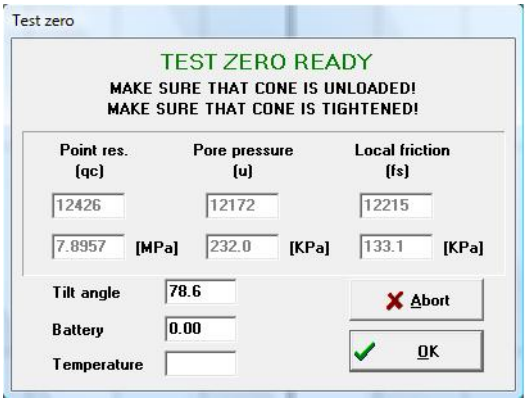


Fig. 3-14: Zero readings

7. If you want to display instantaneous readings, press F9, to conceal them, press F9 again.
8. Press **Start** to begin probing. *Wait until the CPT status field (Fig. 3-1, top bar) is green with the text " CPT Sounding" flashing.*

   In case the tilt increment of the probe or the point resistance exceeds pre-set values, an alarm is triggered (Fig. 3-15). *This will not stop the acquisition of data*. Unless an overload control card (P.N. 41450) is mounted in the CPT Interface box (P.N. 08871) and connected to an electric valve controlling the pushing of the rod string (see User Manual CPT Sounding, Chapter 6, part D), the pushing will not be stopped.

The tilt alarm will normally be triggered at the beginning of soundings, before the probe is stabilised in the ground. See comments under Show Test Options.

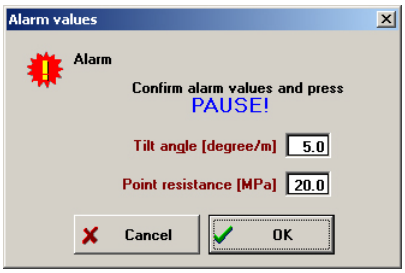


Fig. 3-15: Warning: Tilt increment or point resistance larger than preset values

9. For a dissipation test, Press **Dissipation Start** to begin the test (Fig. 3-16).

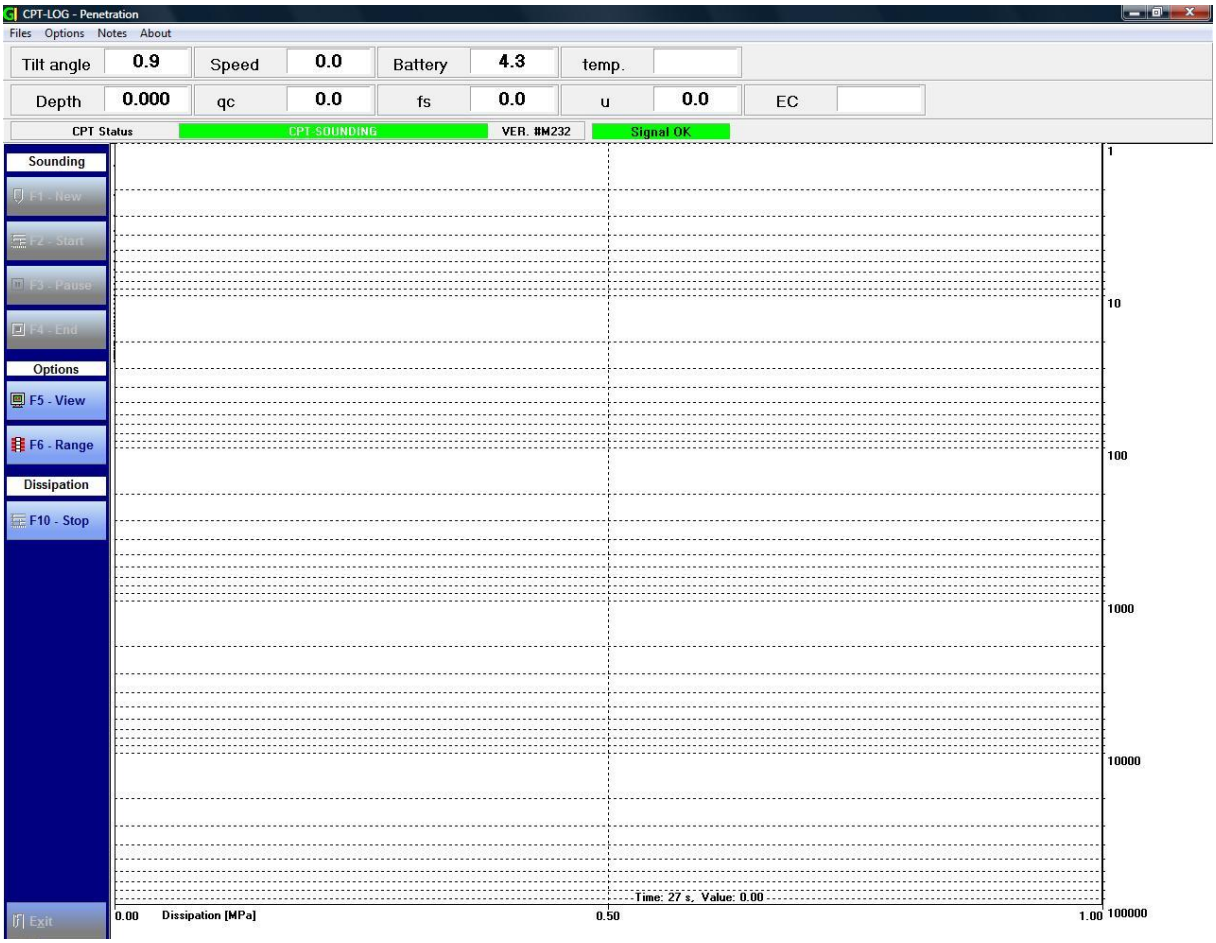
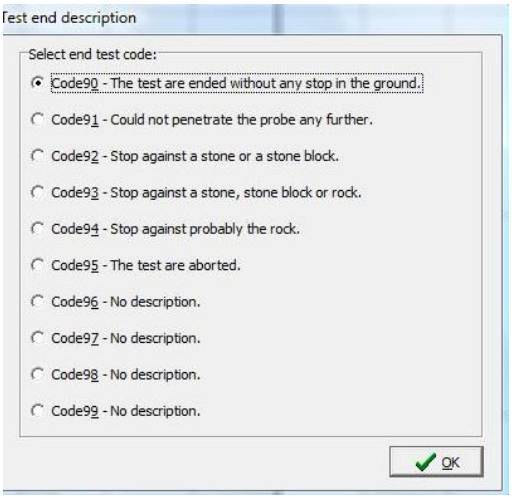


Fig. 3-16: Dissipation test

10. Press **Stop** to stop the dissipation test and **Start** to continue probing
11. At the end of the test, before retrieving the rods and probe, press **Pause**. Otherwise, the graphs will be filled with depth information from the depth encoder during all downward movement of the yoke or drill head when retrieving the rod string and cone.
12. Once all rods and the probe are retrieved, press **End** to finish the test.
13. You will have the option to select a stop code for explaining the reason of ending the test. This will be displayed as “K” in the presentation. (See fig. below).



14. This will initiate a second zero test (Fig. 3-17) which is imperative to make. Otherwise the data format will not be recognised and the readings will not be displayed in the presentation menu. The second data row in this zero test shows the percentage difference of the zero reading before and after test and tells whether any of the channel drift or if parts are damaged. Deviations on local friction and pore pressure can have mechanical reasons (significant wearing of the X-ring or an emptying of the pore pressure chamber) or by caused by sensor drift. No acceptable differences can therefore be given, only that in

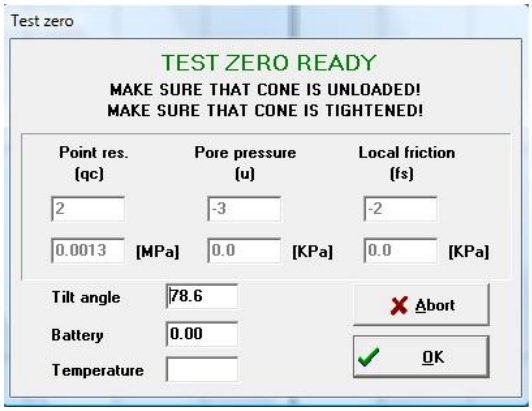


Fig. 3-17: Zero test after sounding

case differences are observed, the operator should keep an eye that these are not mechanically caused. Variations on the point resistance on the contrary can essentially only be caused by sensor drift.

11. Press **Exit** in order to finish the program
12. The data is logged as *.cpt file which is ASCII comma separated. It can therefore be imported in any spreadsheet (Excel, Lotus-1-2-3, etc) or word processing program (For more information, see chapter 6, *.CPT FILES: ASCII COMMA SEPARATED). The data for the individual channels are recorded as they come from the probe, i.e. the point resistance and local friction are not corrected for pore pressure.

Furthermore, no depth correction is applied on the local friction.

4 PRESENTATION

4.1 THUMBNAIL BROWSER

The presentation program is accessed either directly by running CPTGL.EXE or via a thumbnail browser, opened by clicking on ”Presentation” on the shell of CPT-LOG (Fig. 1-1), or by running THUMB.EXE.

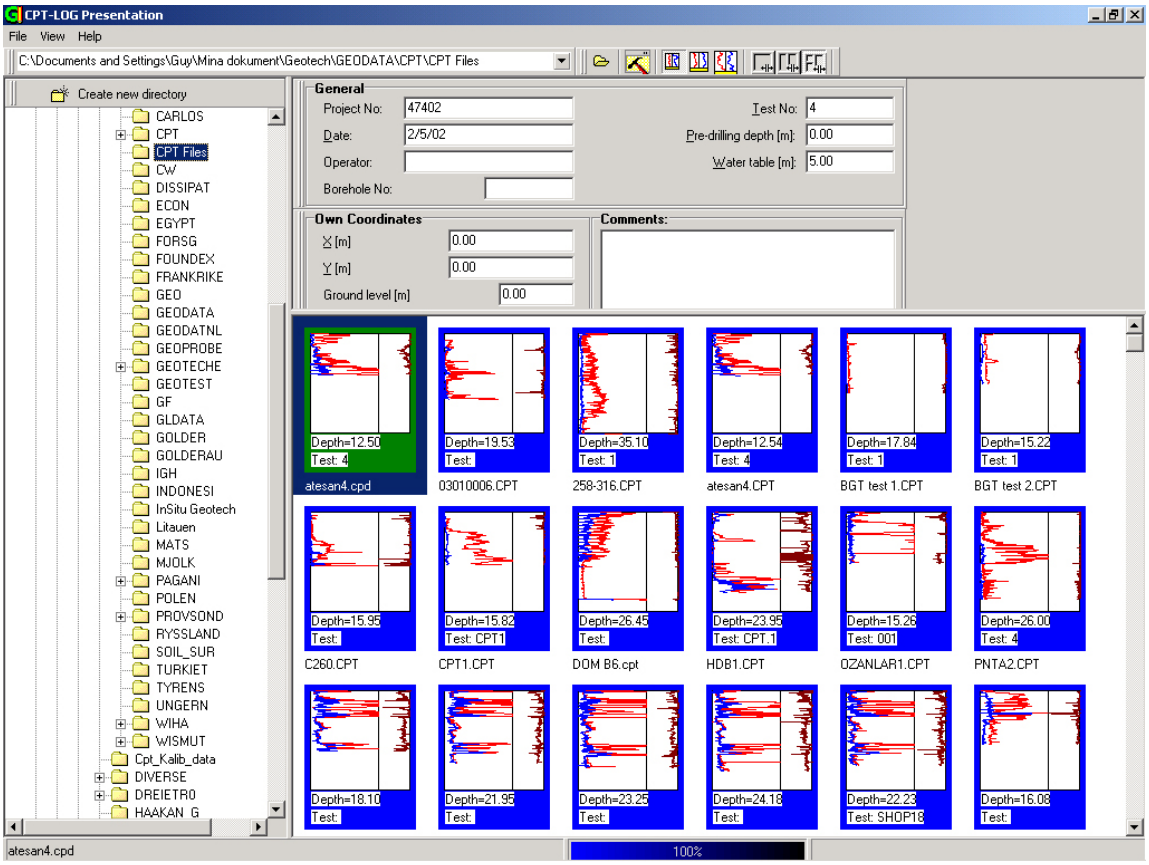


Fig. 4-1: Thumbnail browser displaying most CPT formats. The upper right field displays the header information of the highlighted file (in green)

The icons on the top bar are included in the View/Option menu (Fig. 4-2) which controls the choice of panels to be displayed, CPT formats (most manufacturers’ plus the CPT-pro, the Dutch digital format GEF and the British AGS format), see 4.3.3, the graph format, channel ranges, image size, etc.

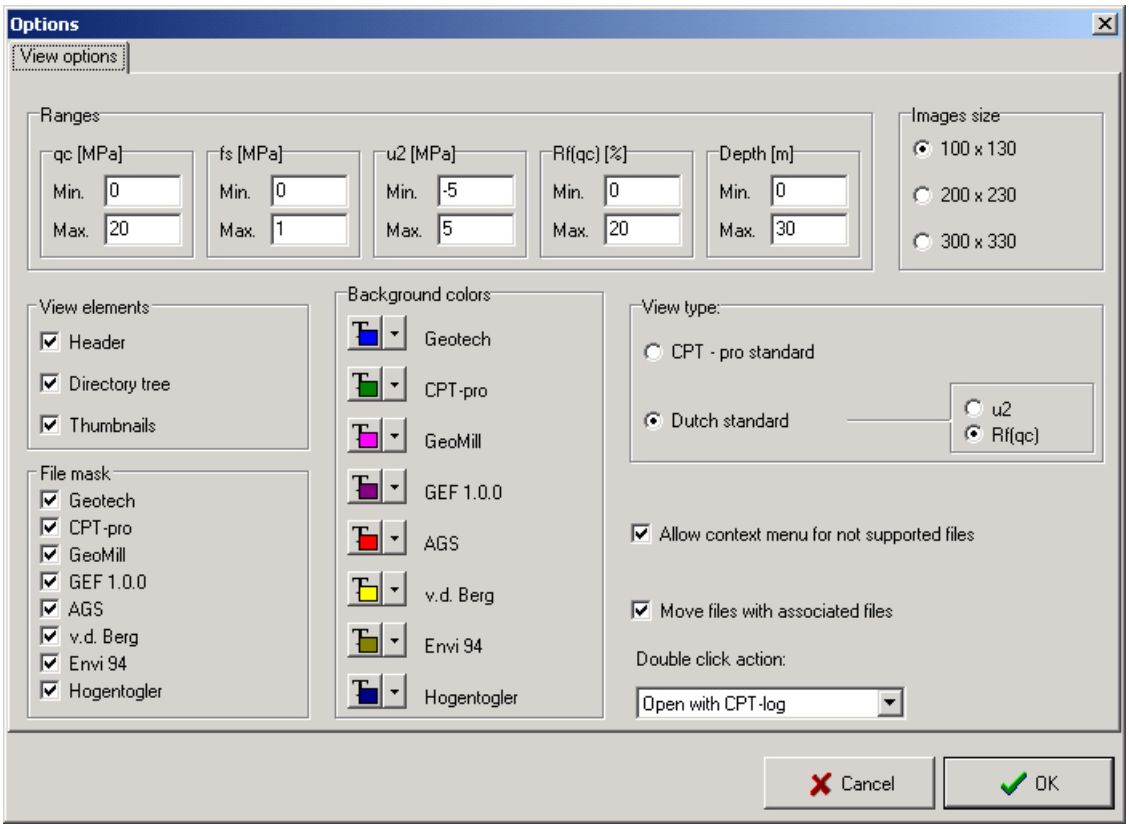


Fig. 4-2: Option menu under Thumbnails

By double clicking the files, these can be opened either by CPT-LOG or CPT-pro.

4.2 OPENING A FILE

The **Graph Setting** panel appears (Fig. 4-3), when double clicking a CPT graph in Thumbnails (the rest of the manual will only deal with Geotech format acquisition files, i.e. *.cpt files). When opening the Presentation module directly with CPTG.EXE, the Graph Setting panel is activated only when clicking **Load** a file (Fig. 4-5).

In addition to CPT-LOG files, CPT files recorded with the DOS software CPTGL can be displayed as well. An error message may appear however and is caused by the first tilt angle (TA) value left blank, see chapter 6 *.CPT FILES: ASCII COMMA SEPARATED. Add the missing value (put any angle) in any word processing program, save and run this presentation software. Files acquired with the DOS software CPTE (prior to 1995) have another format.

The same Graph Setting panel is activated when clicking on Graph and **International Standard** (Fig. 4-12). In addition to the parameter, recorded or calculated, which can be displayed in the Penetration mode, described under 3.1.2, the Presentation module has the following additional ones:

- Point resistance corrected for pore pressure (qt, MPa)
- Local friction corrected for pore pressure (ft, MPa)
- Rf (NEN) (%), According to the Dutch Norm NEN 5140, for CPT cones with no pore pressure measurement, Rf = fs/qc;av x100%, where qc; av = the calculated average of the tip resistance over the length of the friction sleeve at the same depth as the measurement of the local friction is taken.

- Hydrostatic Pressure (HP, MPa)
- Differential Pore Pressure Ratio (DPPR, %)

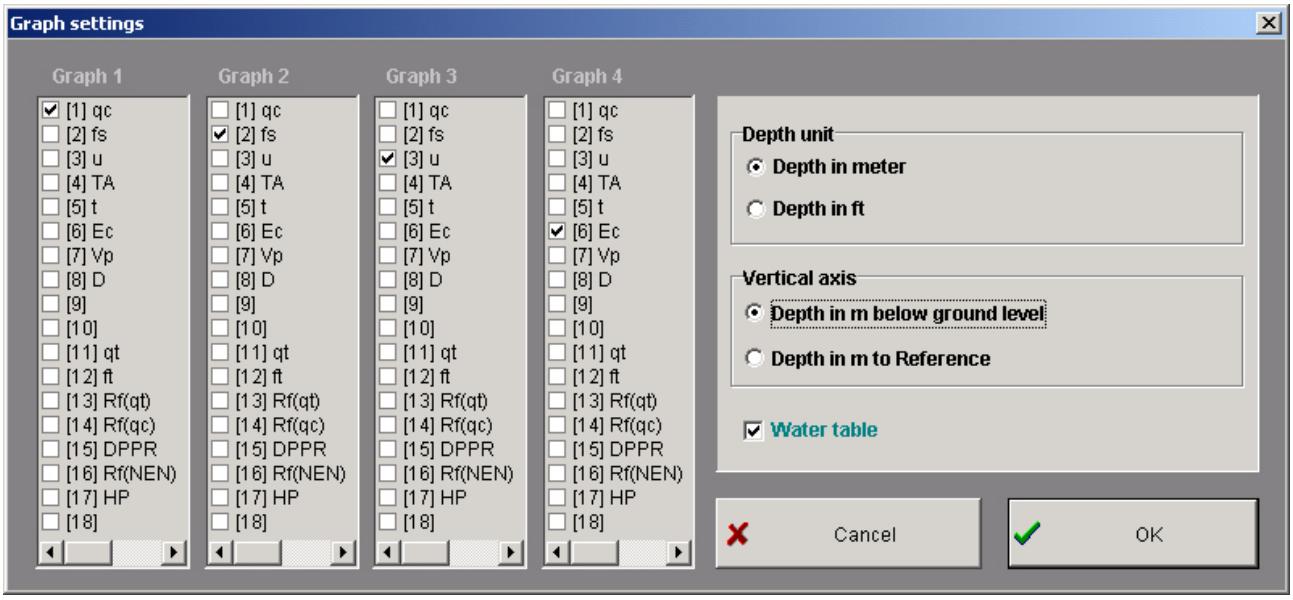


Fig. 4-3: Presentation module – Graph Settings (left of parameter is the allocated channel)

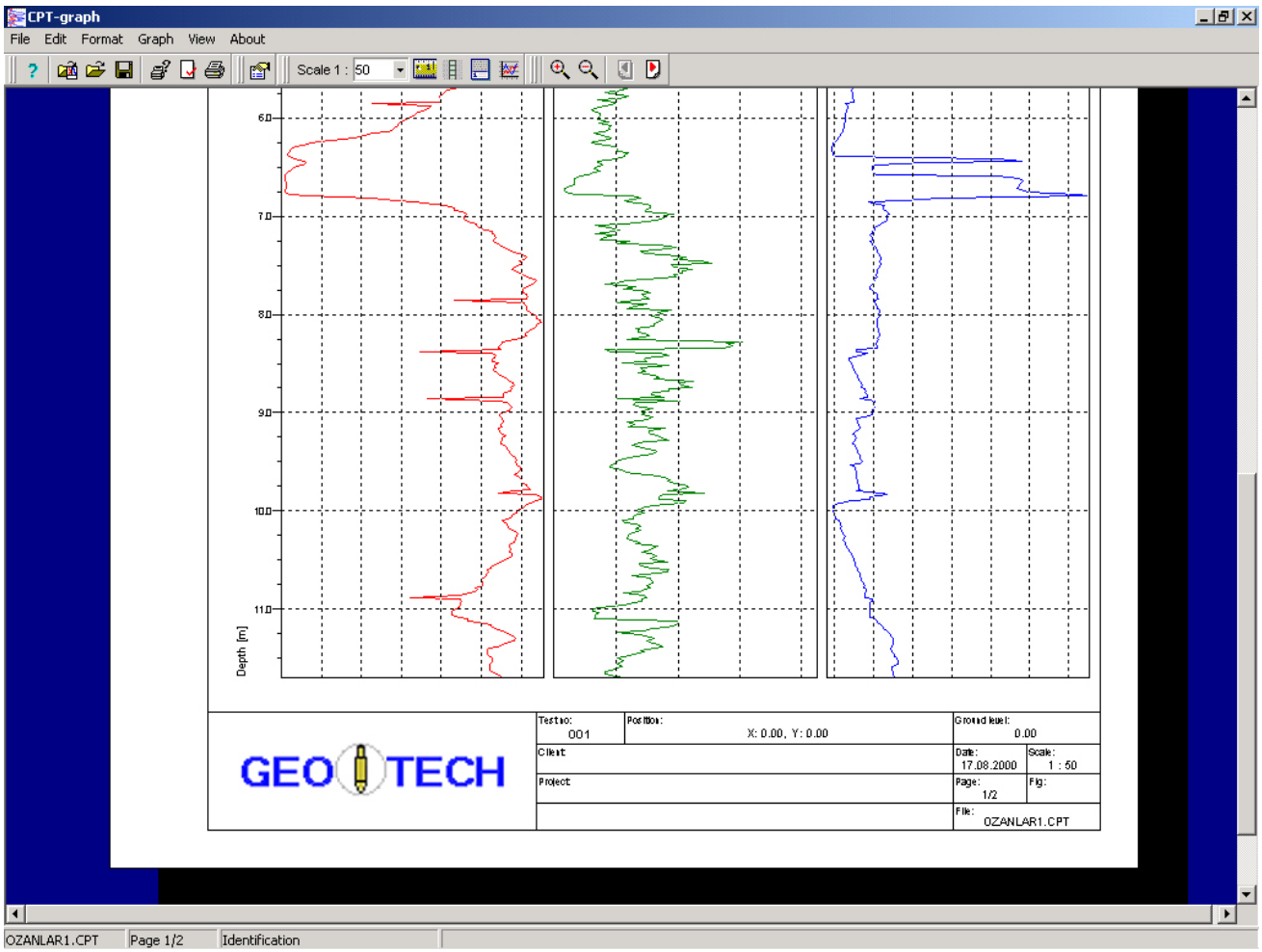


Fig. 4-4: Display of chosen channels of a CPT file

2. Select up to four channels to be displayed, the depth unit (meters or feet), the depth reference and whether the water table should be shown. The graphs will be shown when pressing OK (Fig. 4-4).

4.3 FILE MENU

The File Menu consists of file, page and printer handling functions.

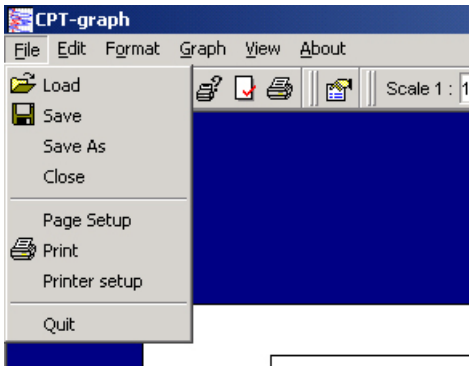


Fig. 4-5: File Menu

1. **Load** is described above, 4.1 Opening a File.

2. The **Save** functions allow the user to save any modifications in the header, but not in the data, with the same raw file name.

3. **Under Save as**, the user can export a file into the CPT-pro (*.cpd), the Dutch digital format GFE (Geotechnical Exchange Format), (information is available at www.geonet.nl, and search GEF-format) or into AGS (Associated of Geotechnical and Geoenvironmental Specialists (www.ags.org.uk/aboutus/welcome.cfm). Finally, for users of the SGI analysis software Conrad, the raw data files can be converted into an old Geotech *.cpt format with u = u + 0.1 MPa

4.4 EDIT MENU

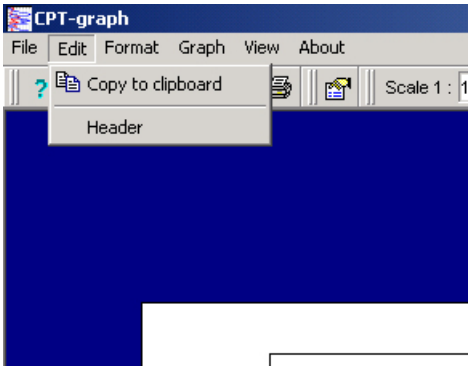


Fig. 4-6: File Menu

The **Header** information in the *.cpt, ASCII comma separated file (Chapter 6), displayed at the foot of the graph (Fig. 4-4) can be edited by accessing Header under Edit Menu (Fig. 4-6) or under Test Description (Fig.4-18). The panel (Fig. 4-7) picks up the information provided before the test, in the Cone Database, (Fig. 2-) and in Test Options (Fig. 3-1)

The Save function works only when loading *.cpd, *gef or *.ags files, not Geotech *.cpt files. These have to be saved as one of the other formats first in order not to modify the raw file

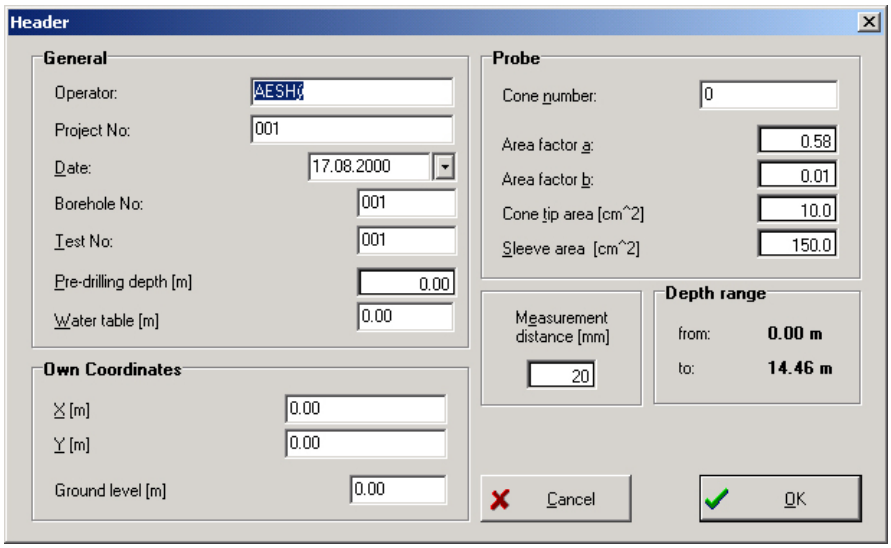


Fig. 4-7: Header and test option

4.5 FORMAT MENU

1. **Colors** and Curve styles can be edited under the Format Menu (Figs. 4-8 and 4-9). For curve styles, inactivate colours first and then activate “Use line style”.
2. The definition of the available Parameters (Fig. 4-10) is accessed under the same menu. Raw parameters in the green fields, calculated in the turquoise ones. The names, abbreviation, definition and resolution can be amended for all parameters and their allocated channel is given. New parameters can be added.

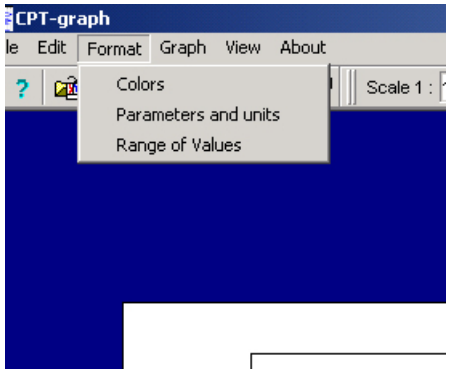


Fig. 4-8: Graph Menu

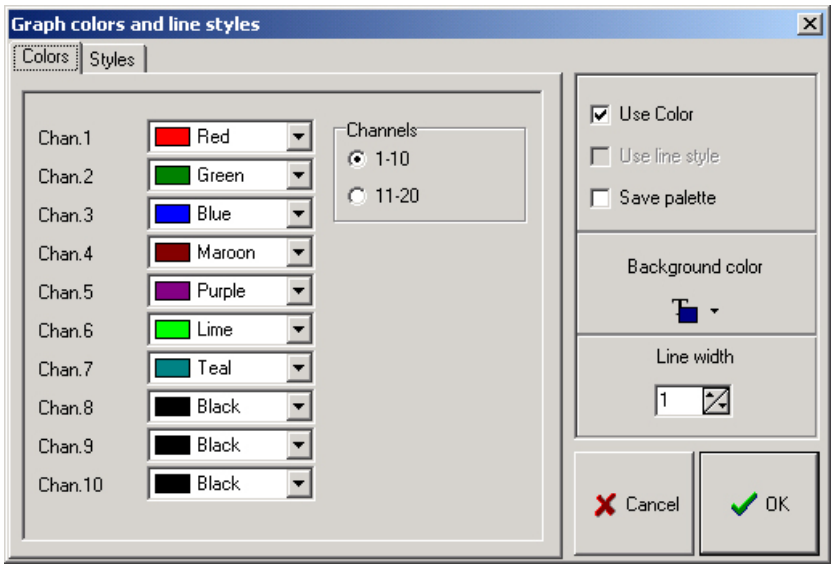


Fig. 4-9: Colour and Curve Style Editing

3. Under **Range of Values** (Fig. 4-11), a summary of the minima and maxima are given for all channels. The channels can be depth corrected with respect to the depth values related to the point resistance values forming the depth reference.

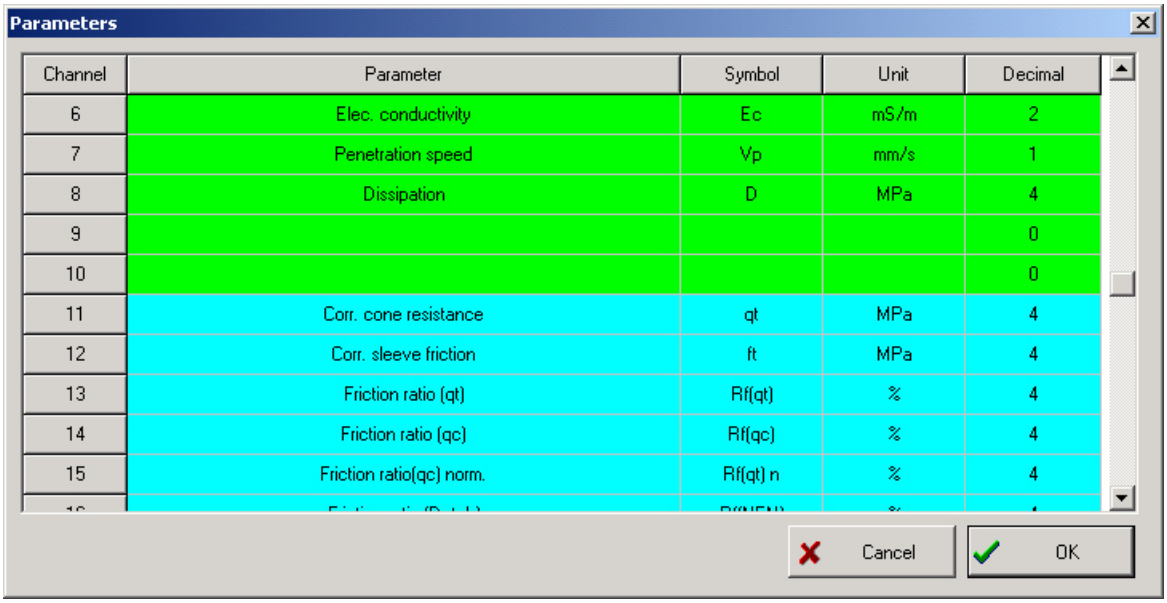


Fig. 4-10: Definition of Parameters

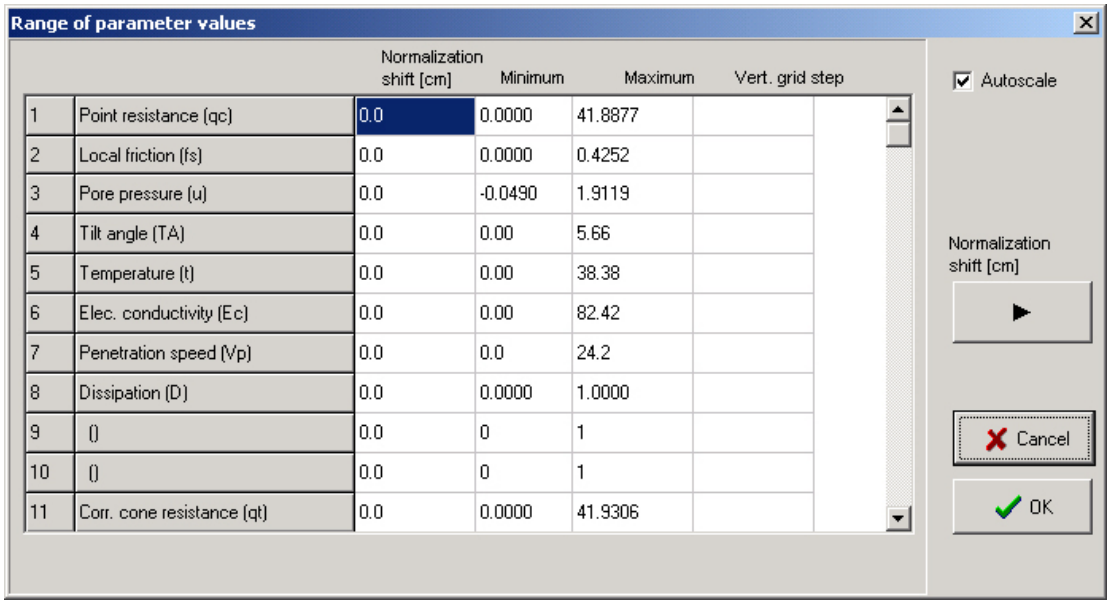


Fig. 4-11: Range of values

4.6 GRAPH MENU

1. The presentation and printing of CPT graphs according to the **International Standard** is chosen under the Graph Menu (Fig. 4-12) and is described above, 4.2.1, Opening a File, Graph Setting.
2. The curves can alternatively be displayed and printed according to the **Dutch standard** (Figs. 4-13 and 4-14), with normally point resistance and sleeve friction left and the friction ratio right. Any combination of available channels can however be done here.

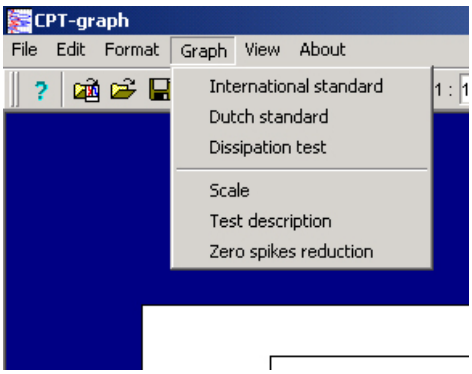


Fig. 4-12: Graph Menu

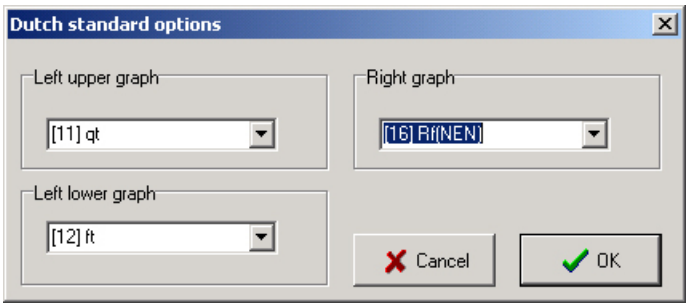


Fig. 4-13: Channel Options in the Dutch Standard for Graphic Display

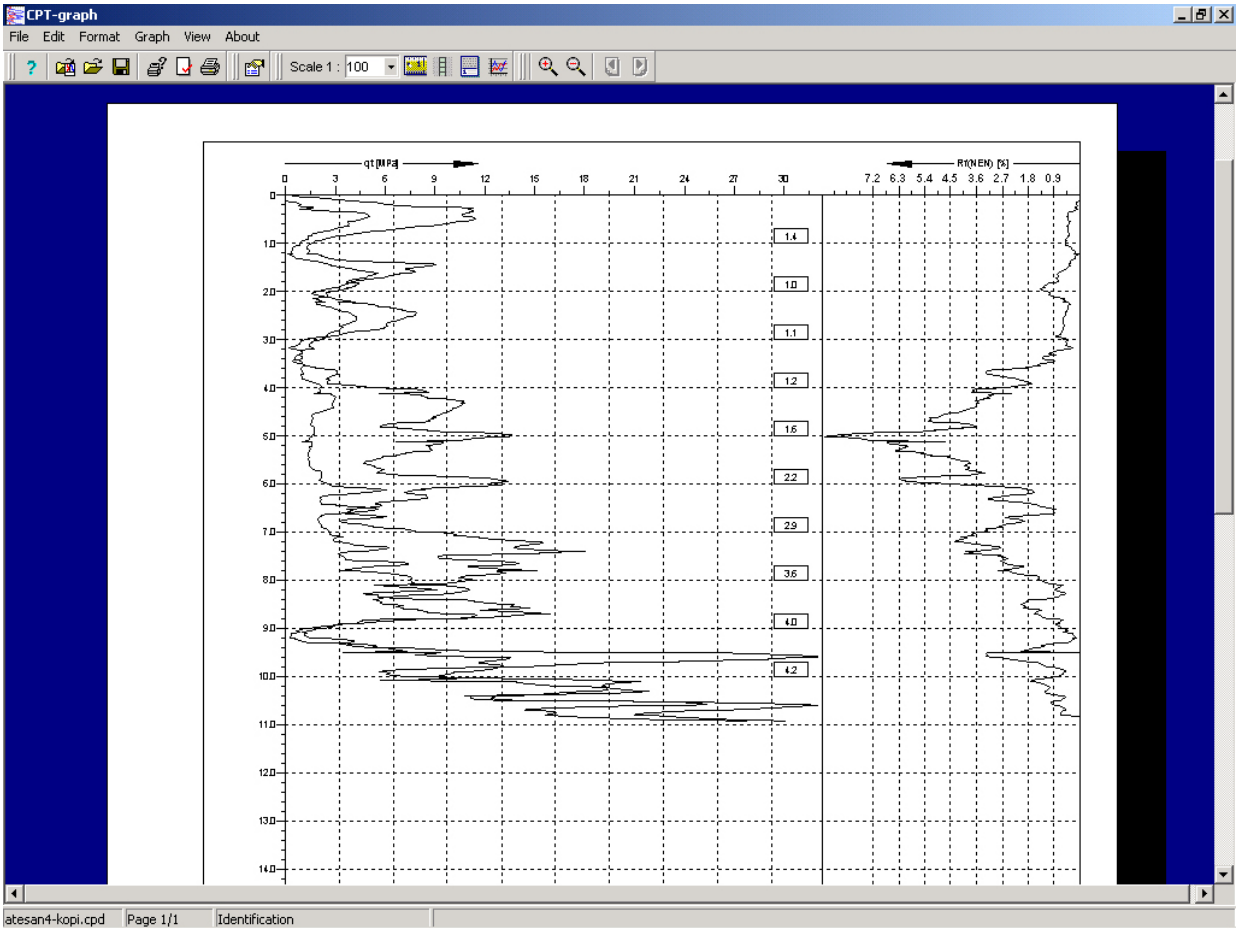


Fig. 4-14: CPT graph with the Dutch Standard, Point resistance and Local friction left, Rf right [Rf (NEN)]

3. **Dissipation tests** are accessed under the Graph Menu (Fig. 4-15) and an example is shown in Fig. 4-16.

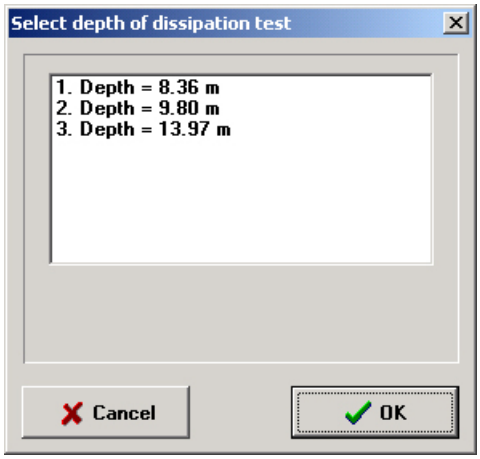


Fig 4-15: Selection of dissipation test to be displayed

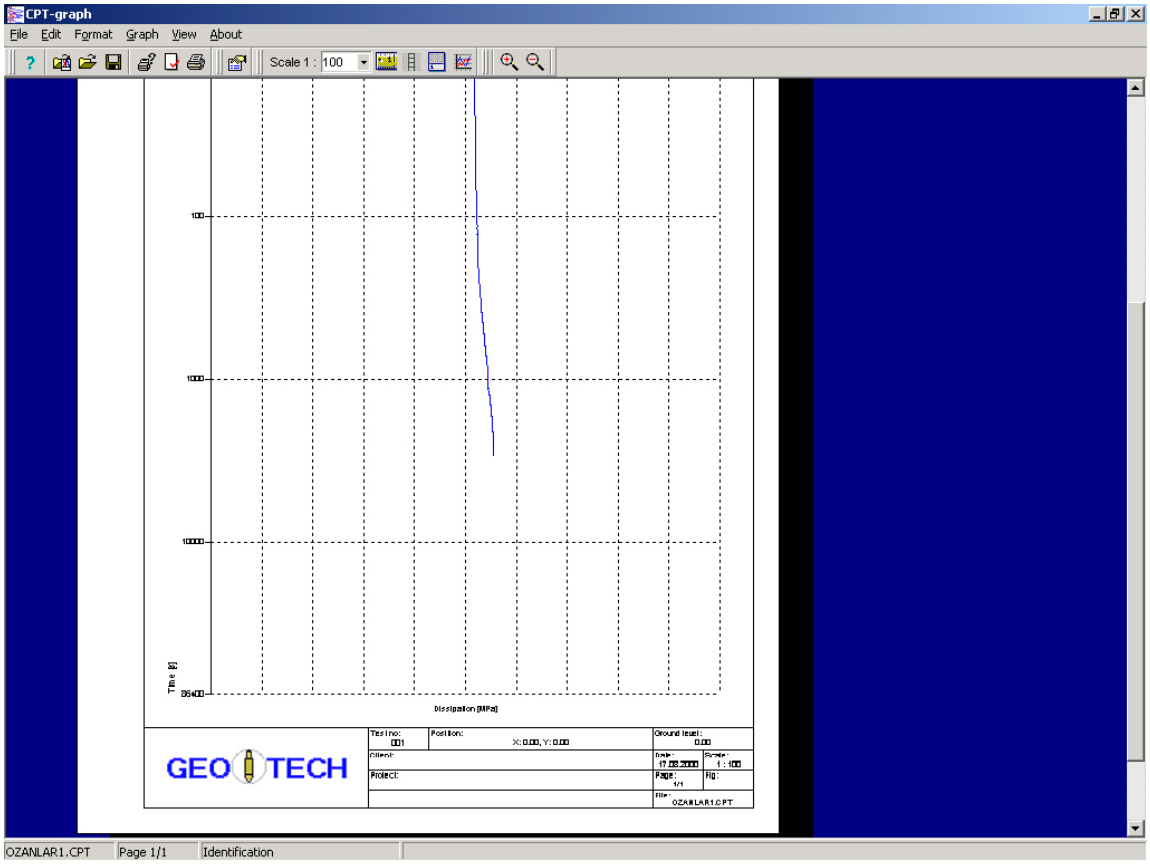


Fig. 4-16: Dissipation Test Display

4. **Scale** can be set at wish. Normally a scale of 1:100 is used

5. **Test Description** as seen in the graph header (Fig.4-18) can be modified when saved as a *.cpd, *gef or *.ags file

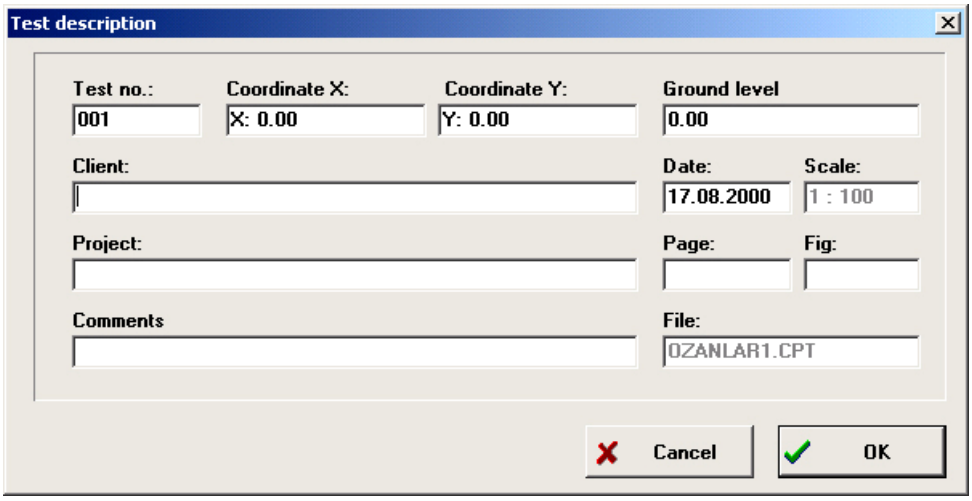


Fig. 4-18: Test Description

The logotype on the graph can be exchanged for any other one by replacing the logo.bmp file with another one with the same name in the program directory.

6. Spikes in the point resistance and local friction channels can be edited in CPT-LOG under **Zero Spike Reduction**, as described in Fig.4-19.

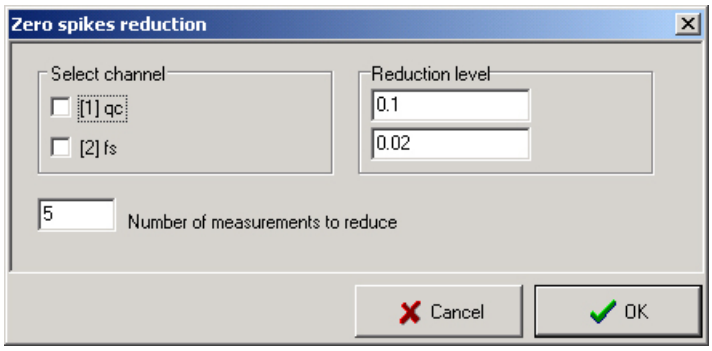


Fig. 4-19: Definition of the Zero Spike Reduction

4.7 View Menu

Apart from **Flags**, the function under **View** are standard for Windows (Fig. 4-20). Flags, as described in 3.1.6, can be displayed on the CPT graph (Fig. 4-21) or in table form (Fig. 4-22).

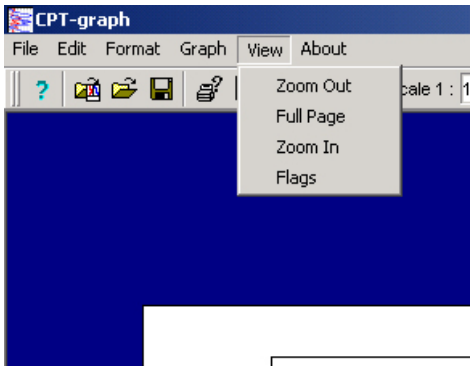


Fig. 4-20: View Menu

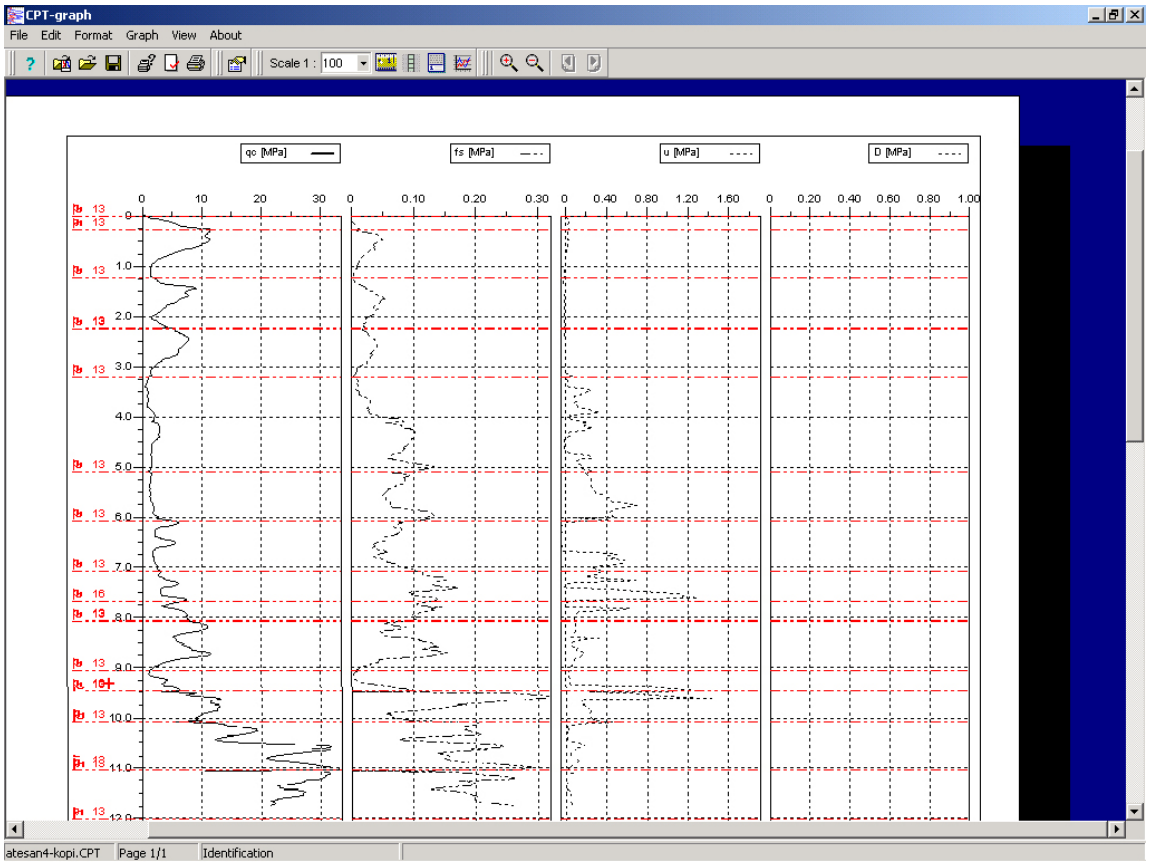
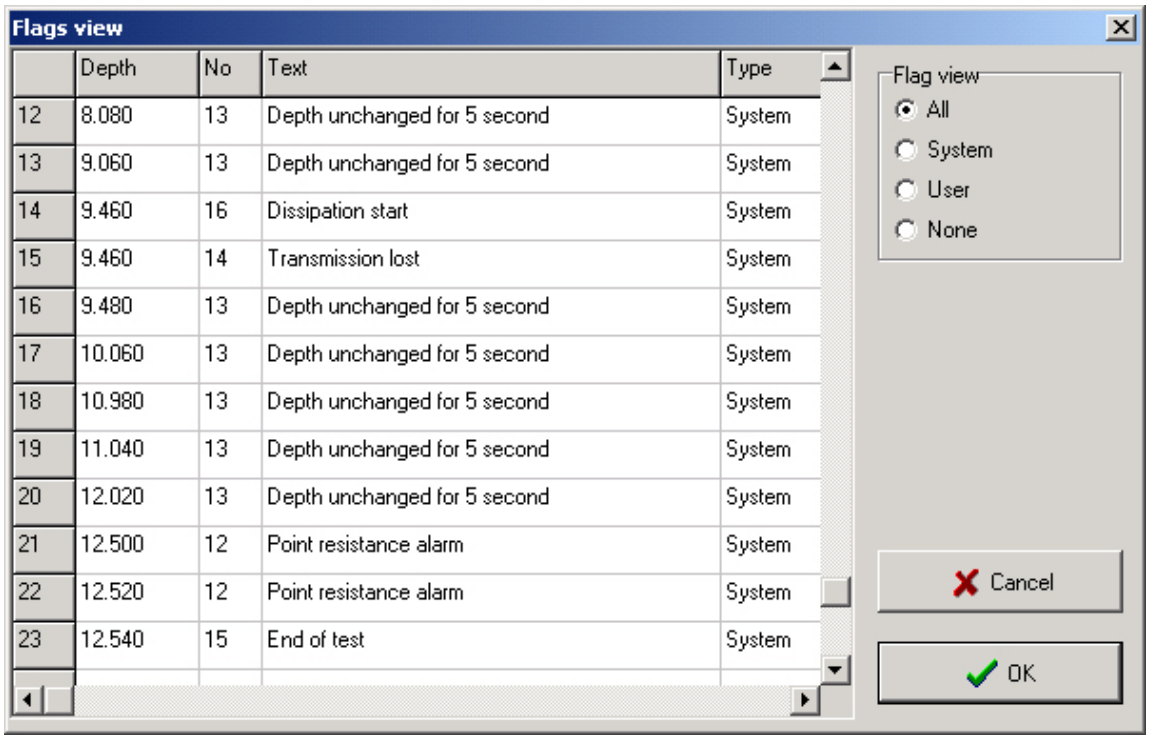


Fig 4-21: CPT Test with the display of Flags, as specified in Fig. 3-8



	Depth	No	Text	Type
12	8.080	13	Depth unchanged for 5 second	System
13	9.060	13	Depth unchanged for 5 second	System
14	9.460	16	Dissipation start	System
15	9.460	14	Transmission lost	System
16	9.480	13	Depth unchanged for 5 second	System
17	10.060	13	Depth unchanged for 5 second	System
18	10.980	13	Depth unchanged for 5 second	System
19	11.040	13	Depth unchanged for 5 second	System
20	12.020	13	Depth unchanged for 5 second	System
21	12.500	12	Point resistance alarm	System
22	12.520	12	Point resistance alarm	System
23	12.540	15	End of test	System

Fug. 4-22: List of flags from a CPT test, displayed in table form

5. BACK-UP MEMORY

5.1 CLASSIC TYPE PROBE

This procedure is developed in order to be as easy and automatic as possible.

The data in the "Back-up memory" have to be synchronized with the CPT-files recorded on surface because only on surface the depth has been recorded. The synchronisation is carried out by the recorded time which has been elapsed since the cone has been connected to the sound transmitter (cordless CPT) or to the cable adapter (cable mode CPT) using the Classic cone.

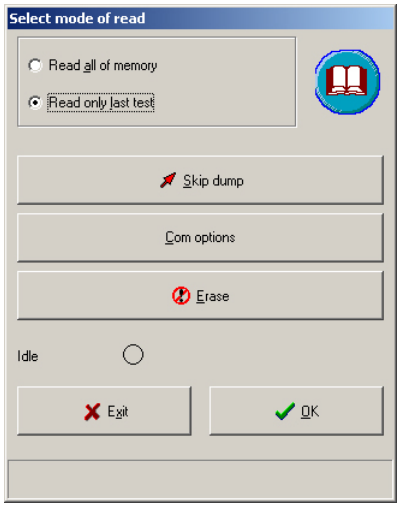


Fig. 5-1: Select mode for reading the memory

1. Connect your Classic cone to the read out adapter which should be connected to the read out interface. The read out interface has a serial port you should connect to your Computer.
2. Switch on the readout interface and start the "Back-up memory" module from CPT-Log (Fig. 1-1). The "select mode of read" window appears (Fig. 5-1) from which you choose between two read out alternatives.
3. Depending on the amount of data stored in the "Back-up memory" reading out the data will take some time. You can choose to read out all data in the memory or only the last sounding (Fig. 5-1).
4. After pressing <OK> the read out starts and "Idle" turns to "Reading". A green light will be flashing next to “Reading”. When the read out is completed the green light stops flashing and a small message window appears.

   Note: You can also skip the dumping (read out) process when you only want to synchronize a previously downloaded memory.

5. Data from the "Back-up memory" are stored as DUMP.TXT file, each time with the same name. If you readout new data from memory, any previous DUMP.TXT file will be overwritten. If you would like to save DUMP.TXT just change the name or move to a different folder.

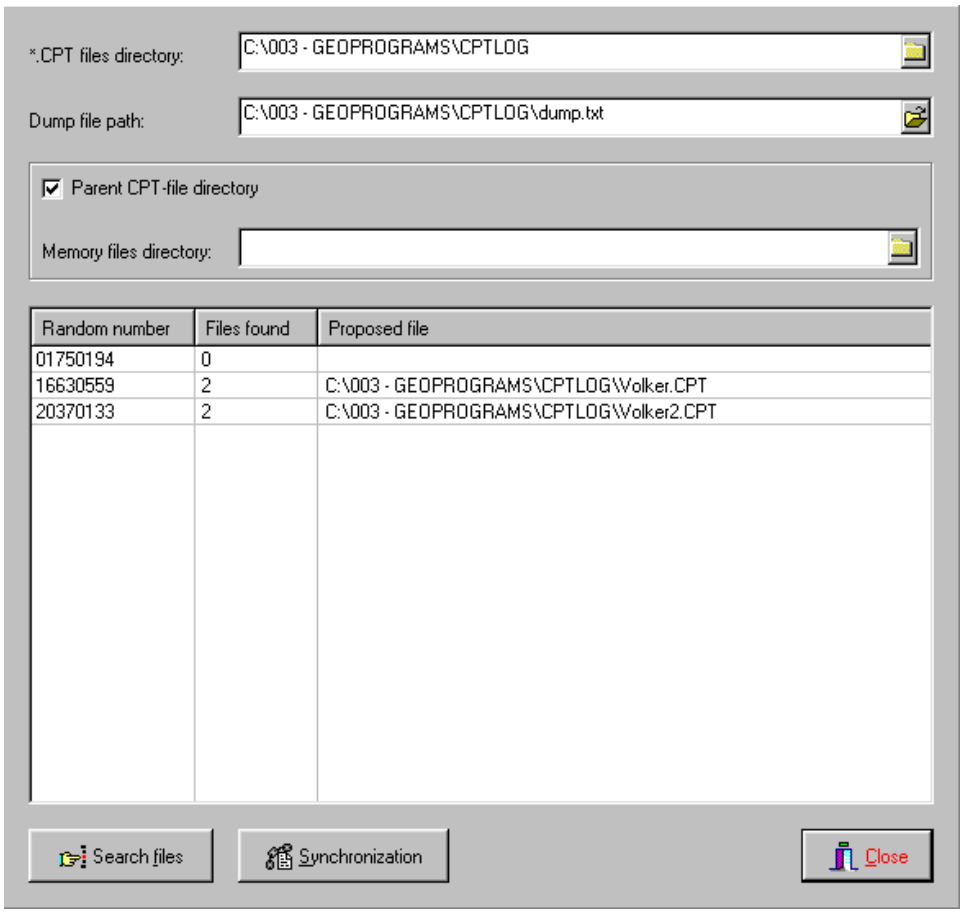


Fig. 5-2: Synchronization menu for specifying the file directories

6. After the read out has been completed the "Synchronization menu" window appears (Fig. 5-2). During synchronisation of DUMP.TXT with the data recorded on surface *_m.CPT files will be created which takes only a few seconds.
   We recommend to create *_m.CPT files immediately after readout data from back-up memory.

7. When choosing <Search files> in the "Synchronization menu" the software finds all relevant files which can be synchronized in the directory path specified before and displays them in a list.

8. The "Parent CPT-file directory" is set as default directory for storing the synchronized memory files. You can also specify a different location for the memory files by deactivating the check-box and applying the folder symbol . A Windows™ typical menu will open and you can choose the desired directory.

9. Now you can apply <Synchronization> and the respective *_m.CPT files will be created. Note. Software will try to find *.CPT files not only in defined folder, but also in all subfolders. Therefore if you do not know exactly where your *.CPT files are (reference files for *_m.CPT files), just set a more general path. It is even enough to set c:\ but in such case looking for *.CPT files will take too much time.

After the synchronization has been completed you can process the memory files in the same way as the files recorded on surface.

In case of any signal disturbances during the sounding process or in case you have to present the CPT data according to "Class 1 CPT" with an 18bit resolution you should use the memory files for further presentation and/or interpretation of your soundings.

NOVA TYPE PROBE

This procedure is developed in order to be as easy and automatic as possible.

The data in the "Back-up memory" have to be synchronized with the CPT-files recorded on surface because only on surface the depth has been recorded. The synchronisation is done using USB. Synchronisation is done automatically when the cone is added to the cone database or when data is erased from the cone. You can also manually synchronise the cone in the penetration window choosing options in the menu and then cone synchronisation.

1. Connect your Nova cone directly to the computer using USB.

2. Choose Back-up memory in the main menu (Fig. 1-1). It is then recommended that you automatically search for the cone in the following window. In the next window you can choose if you want to read all data in memory or just data in a specified time period.
3. Then you have to choose a directory for you synchronisation of data.

4. In the next window you can choose dump file. It is recommended that you use the default dump file. The dump file is then stored in the Cptlog program directory in the dump backup folder.

5. The data is then synchronized. Click finish when the synchronisation is completed.

6. *.CPT FILES: ASCII COMMA SEPARATED

1. When displaying the acquired data (in a *.cpt file) in a word processing or spreadsheet program, the following shows for a standard cone:

```
$
HA=1,HB=3,HC=CPTLOG-1.00,HD=09/04/99,HG=0.00,
HJ=KURP,HL=  ,HM=07,HN=3218,HO=0,KQ=1325,KF=6236,KU=2673
#
D=0.150,QC=0.13,FS=72,U=6,TA=1.4,B=00,NA=11.80,NB=146,NC=457
D=0.170,QC=0.11,FS=0,U=0,TA=.9,B=19
D=0.190,QC=1.69,FS=1,U=7,TA=1,B=18
D=0.210,QC=1.82,FS=2,U=8,TA=.7,B=19
D=0.230,QC=2.08,FS=13,U=9,TA=.7,B=19
D=0.250,QC=2.25,FS=17,U=9,TA=.8,B=18
D=0.370,QC=2.30,FS=22,U=9,TA=.8,B=20
D=0.390,QC=2.23,FS=30,U=8,TA=1.1,B=19

D=2.000,QC=23.02,FS=129,U=40,TA=1.4,B=18
D=2.020,QC=23.42,FS=146,U=42,TA=1.4,B=18
D=2.040,QC=25.03,FS=107,U=41,TA=1.4,B=12
D=2.060,QC=27.49,FS=93,U=41,TA=1.3,B=08
D=2.080,QC=25.93,FS=84,U=41,TA=1.3,B=0,NA=0.00,NB=0,NC=100
```

2. For a backup memory cone the *.cpt file is as follows for data transmitted acoustically:

```
$
HA=1,HB=1,HC=CPTLOG-2.00,HD=2002-05-
16,HG=0.00,HM=07,HN=1234,HO=0.00,HX=0.00,HY=0.00,HZ=0.00,KQ=2500.00,KF=5000.00,KU=2500.00,MA=1.0
00,MB=0.000,MC=10.0,MD=150.0,MF=0.000
RN=16422611,CA=0,CB=0
#
D=0.000,QC=0.000,FS=0,U=0,TA=5.0,O=0.0,B=0,M=0.0,%74701 ,F=13,NA=4.00,NB=101,NC=391
D=0.020,QC=0.010,FS=1,U=0,TA=12.2,O=0.0,B=26,M=0.0,%113597
D=0.040,QC=0.010,FS=2,U=0,TA=12.9,O=0.0,B=27,M=0.0,%114348

D=1.060,QC=0.010,FS=6,U=0,TA=11.1,O=0.0,B=45,M=0.0,%196867
D=1.080,QC=0.010,FS=6,U=0,TA=8.7,O=0.0,B=39,M=0.0,%197598, F=11
D=1.100,QC=0.000,FS=6,U=0,TA=7.2,O=0.0,B=47,M=0.0,%197988
D=1.120,QC=0.000,FS=0,U=0,TA=7.2,O=0.0,B=97,M=0.0,%198389
D=1.140,QC=0.000,FS=0,U=0,TA=7.2,O=0.0,B=18,M=0.0,%199110 ,F=15,NA=0.00,NB=0,NC=0,F=15
#$
0:
1:
2:
3:
4:
5:
6:
7:
8:
9:
11:Tilt derivative alarm
12:Point resistance alarm
13:Depth unchanged for 5 second
14:Transmission lost
15:End of test
16:Dissipation start
```

3. The same file but generated from the stored data in the back-up memory (labelled *_m.cpt)

```
$
HA=1,HB=1,HC=CPTLOG-2.00,HD=2002-05-
16,HG=0.00,HM=07,HN=1234,HO=0.00,HX=0.00,HY=0.00,HZ=0.00,KQ=2500.00,KF=5000.00,KU=2500.00,MA=1.0
00,MB=0.000,MC=10.0,MD=150.0,MF=0.000
RN=16422611,CA=0,CB=0
#
D=0.000,QC=-0.0003,FS=0.0,U=0.2,TA=5.06,B=0,%74625,NA=4.00,NB=101,NC=391
D=0.020,QC=0.0101,FS=1.2,U=0.4,TA=13.46,B=26,%113250
D=0.040,QC=0.0159,FS=1.2,U=0.4,TA=12.20,B=27,%114000

D=1.080,QC=0.0183,FS=6.3,U=0.7,TA=11.15,B=39,%197250
D=1.100,QC=0.0162,FS=6.3,U=0.7,TA=8.75,B=47,%197625
D=1.120,QC=0.0082,FS=6.3,U=0.7,TA=7.25,B=97,%198375
```

```
D=1.140,QC=0.0082,FS=0.1,U=0.7,TA=7.25,B=18,%198750,NA=0.00,NB=0,NC=0,F=15
```

The first line contains all the Header information with the following abbreviations:

HA = Running number, generally 1
HB = Sounding number, generally 1
HC = Software used
HD = Date (Fig. 3-1)
HG = Ground water level (Fig. 3-1)
HJ = Project number (Fig. 3-1)
HM = Sounding method numbering according to the Swedish Geotechnical Society, 07 corresponds to CPT
HN = Probe identification number (Fig. 3-4)
HO = Pre-drilling depth (m) (Fig. 3-1)
HQ = Operator (Fig. 3-1)
HX = X coordinate (Fig. 3-1)
HY = Y coordinate (Fig. 3-1)
HZ = Z coordinate
KQ = Scaling factor, point resistance (Fig. 3-4)
KF = Scaling factor, local friction (Fig. 3-4)
KU = Scaling factor, pore pressure (Fig. 3-4)
A = Scaling factor, electric conductivity
B = Inversion factor, electric conductivity (A and B if equipped with sensor)
MA = Area factor a (Fig. 3-4)
MB = Area factor b (Fig. 3-4)
MC = Cone tip area (Fig. 3-4)
MD = Sleeve area (Fig. 3-4)
ME = Test number (Fig. 3-1)
MF = Density of the first layer (Fig. 3-1)

The soundings values come as:

D = Depth (m)
QC = Point resistance (MPa)
FS = Local friction (kPa)
U = Pore pressure (kPa)
TA = Tilt angle (Degrees)
B = Velocity (cm/s)
O = Temperature (Degrees centigrade)
M = electric conductivity data (mS/m)
MUNIT = electric conductivity raw data, 1-8 decimals
F = Flag
% = Random number generated for synchronisation of cone and uphole electronics and software

At the end of the first sounding values, the zero readings appear in non-engineering units:
NA = Point resistance, should be around 400 digital steps before the test
NB = Local friction, should be around 400 digital steps before the test
NC = Pore pressure, should be around 400 digital steps before the test

At the end of last sounding line, the second zero reading values appear in difference from the initial zero reading.

Resolution

The resolution with the cordless data transmission is 2^{12} giving:

Point resistance (50 MPa range): 18 kPa; Local friction (500 kPa range): 0.2 kPa; Pore pressure (2.5 MPa range): 1 kPa. Of historical reasons, the local friction has until CPT-LOG ver 2.11 only been recorded with 1 kPa resolution and is now amended to 0.1 kPa. The other channels are recorded with 1 kPa resolution.

The back-up data and the data transmitted by cable has a resolution of 2^{18}, i.e. a difference of 2^6, or 64 times. Geotech has chosen to limit the increase in resolution when recording the data with one decimal on all channels to 0.1 kPa.

7. APPENDING TWO CPT FILES

Appending two CPT files from the same sounding is done as follows:

FIRST SOUNDING

```
$
HA=1,HB=1,HC=CPTLOG-1.00,HD=06/13/2000,HG=0.00,HJ=FS
Docks,HK=1,HM=07,HN=3234,HO=0.00,HQ=Lorne,HX=0.00,HY=0.00,HZ=11.50,KQ=1320.00,KF=6035.00,
KU=2370.00,MA=0.580,MB=0.014,MC=0.5,MD=0.2,ME=cpt1,MF=0.000
#
D=0.000,QC=0.000,FS=0,U=2,TA=0.5,B=0,NA=7.30,NB=90,NC=508
D=0.020,QC=0.000,FS=0,U=2,TA=0.3,B=8
D=0.040,QC=0.000,FS=-0,U=2,TA=0.4,B=14
D=0.060,QC=0.000,FS=0,U=2,TA=0.3,B=20
......
D=15.800,QC=16.507,FS=18,U=236,TA=8.7,B=21
D=15.820,QC=17.209,FS=16,U=219,TA=8.7,B=21
```

SECOND SOUNDING

```
$
HA=1,HB=1,HC=CPTLOG-1.00,HD=06/13/2000,HG=0.00,HJ=fs
docks,HM=07,HN=3234,HO=15.82,HQ=lorne,HX=0.00,HY=0.00,HZ=0.00,KQ=1320.00,KF=6035.00,KU=237
0.00,MA=0.580,MB=0.014,MC=0.5,MD=0.2,ME=cpt2,MF=0.000
#
D=15.820,QC=0.000,FS=0,U=1,TA=9.0,B=0,NA=17.70,NB=87,NC=669
D=15.840,QC=0.166,FS=0,U=6,TA=9.0,B=20
D=15.860,QC=1.941,FS=60,U=2,TA=9.0,B=20
D=15.880,QC=4.215,FS=78,U=19,TA=9.0,B=21
D=15.900,QC=8.614,FS=60,U=-5,TA=9.1,B=22
......
D=30.720,QC=1.775,FS=162,U=128,TA=20.7,B=21
D=30.740,QC=1.386,FS=156,U=127,TA=20.6,B=21
D=30.760,QC=0.850,FS=154,U=126,TA=20.6,B=21
D=30.780,QC=-0.444,FS=151,U=123,TA=20.5,B=21,NA=-4.80,NB=153,NC=146
```

CORRECTION

IVqc:=Interface Value of first channel coming from interface (qc)
IVfs:=Interface Value of second channel coming from interface (fs)
IVu:=Interface Value of third channel coming from interface (u)
SF*:= scaling factor of * channel
ZVqc:=Zero Test Value of first channel (qc)
ZVfs:=Zero Test Value of second channel (fs)
ZVu:=Zero Test Value of third channel (u)

Formulas:

(1) Zero reading qc: NA = ZVqc/SFqc; NA_1=7.30(1st test),NA_2=17.70 (2nd)
(2) Zero reading fs: NB = ZVfs/SFfs; NB_1=90 (1st test), NB_2=87 (2nd)
(3) Zero reading u: NC = ZVu/Sfu; NC_1=508 (1st test), NC_2=669 (2nd)

(4) qc = (IVqc-ZVqc)/SFqc = IVqc/SFqc - NA
(5) fs = (IVfs-ZVfs)/SFfs = IVfs/SFfs - NB
(6) u = (IVu-ZVu)/Sfu = IVu/Sfu - NC

Integration of second sounding into first sounding:

At 15.820 m, second test, qc = 0.000, fs = 0 and u = 1. Using the second zero readings: the three IV/SF equal at this level:

- qc = 0.000 = IVqc/SFqc – NA_2 = IVqc/SFqc - 17.70 ⇨ IVqc/SFqc = 17.70 MPa
- fs = 0 = IVfs/SFfs – NB_2 = IVfs/SFfs – 87 ⇨ IVfs/SFfs = 87 kPa
- u = 1 = IVu/SFu – NC_2 = IVu/Sfu – 669 ⇨ IVu/SFu = 670 kPa

Then in a second step, correct the qc, fs and u readings of the second test with the zero readings from the first part of the test:

- qc_{corr} = qc + IVqc/SFqc - NA_1 = 0 + 17.70 - 7.30 = 10.40 MPa
- fs_{corr} = fs + IVfs/SFfs - NB_1 = 0 + 87 - 90 = -3 kPa
- u_{corr} = u + IVu/SFu - NC_1 = 1 + 670 - 508 = 163 kPa

The correction to be applied in the soundings is thus as follows:

- qc_{corr} = qc – (NA_1 - NA_2) = 0 - 7.30 + 17.70 = 10.40 MPa
- fs_{corr} = fs - (NB_1 – NB_2) = 0 - 90 + 87 = -3 kPa
- u_{corr} = u - (NC_1 – NC_2) = 1 – 508 + 669 = 162 kPa

Note that there is a difference of 1 kPa on the pore pressure between the correction of the second zero crossing and the correction to be applied. A mismatch of one or two steps is not unfrequent when reading the zeros, see the first part of the sounding.