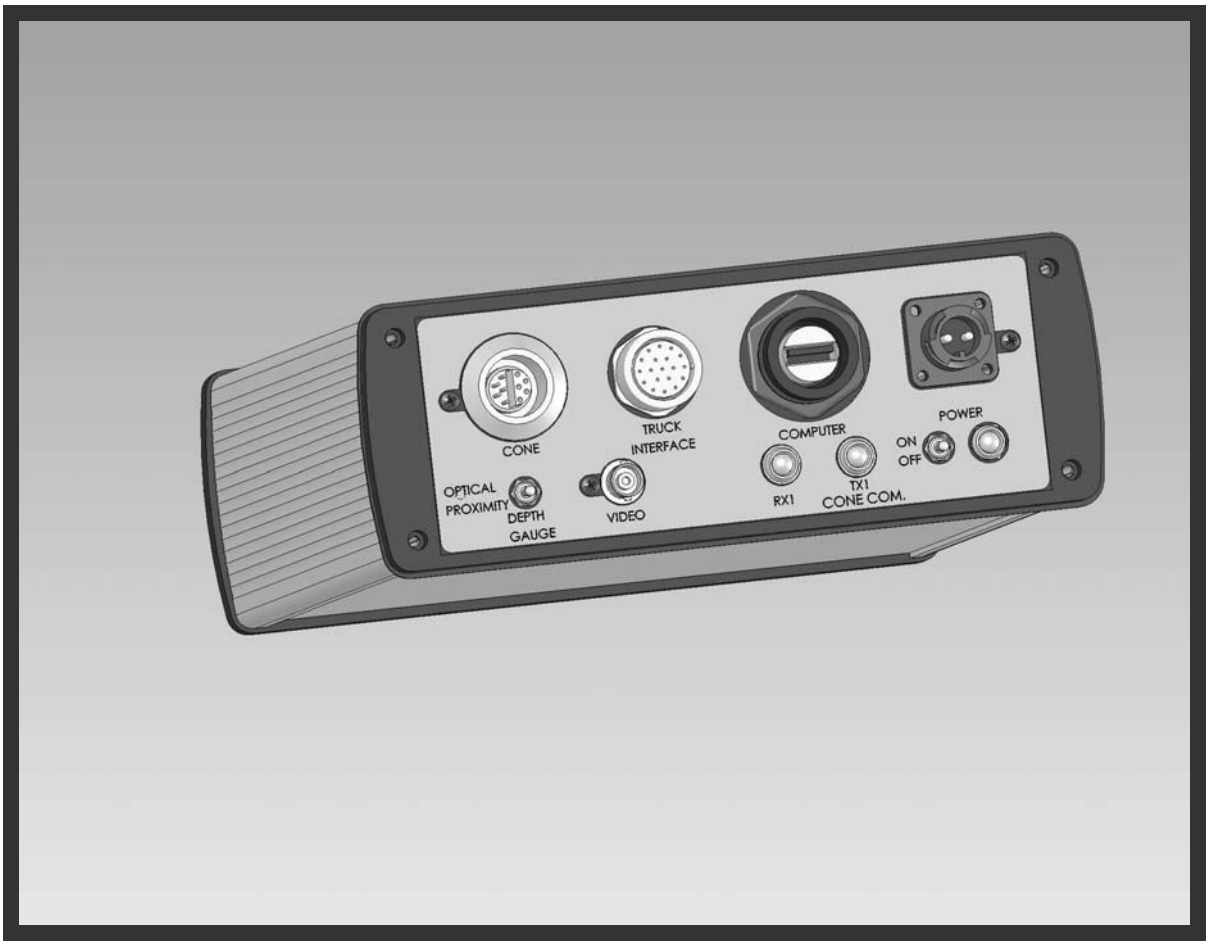
Datapack FCS Instruction Manual



VERTEK, Quality Products Manufatured by:
Applied Research Associates, Inc.
250 Beanville Road
Randolph, VT 05060 USA
Phone: 800-639-6315
www.vertek.ara.com

DPFCS INSTRUCTION MANUAL

INTRODUCTION

The Vertek Datapack FCS is an advanced platform for the acquisition of Cone Penetrometer (CPT) data .The Datapack FCS allows the user to perform CPT tests with minimal effort and learning. The included software, CPTSND for Windows, is designed to give the operator the maximum amount of feedback from the cone while presenting it in a format to prevent information overload.

This manual is intended to get the user started with the Datapack FCS and CPTSND and to help the user acquire accurate CPT data. It is not intended to be a primer on the proper interpretation of CPT data. There are many different standards for the interpretation of CPT data and an attempt to tutor the user in these standards is beyond the scope of the manual and its author.

GETTING STARTED

SETTING UP THE HARDWARE

Setting up the Datapack FCS is simple. There is only 1 connection to the laptop computer and 1 to 4 connections for the truck interface, depending on the pushing platform configuration.

The 4 connections for the Datapack FCS are as follows (see Picture 1): (**1**) the 15 pin truck interface connector, (**2**) the Datapack FCS power, (**3**) the computer USB cable ,and (**4**) the cone. All 4 connections are located on the Front panel of the Datapack FCS. To access the connectors, unscrew the protective covers. The connections are of different types to make attaching the correct cables simple.

The four connectors to the truck interface are located on the yellow junction box. They are as follows: (1) depth counter, (2) headload and pressure switches, (3) seismic trigger and (4) solenoid switch. They are labeled on the junction box. If the labels wear off, there are numbers that are etched on the box that correspond to the switches: 1-DEPTH, 2-HEADLOADPRESSURE, 3-SEISMIC and 4-SOLENOID.

The cables that plug into the interface box have a few extra connections, depending on the pushing platform setup. They are described below. NOTE: Some of the switches and cables described below may not be present, depending on the setup of the pushing platform. Only the depth counter is absolutely necessary to perform a sounding.

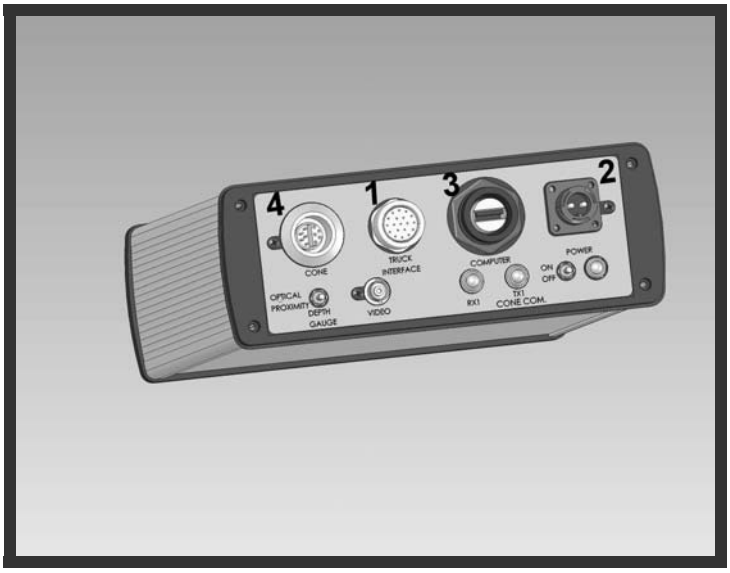
DEPTH -The depth counter may be mounted on the hydraulic ram set or on a ground mounted depth wheel, depending on the setup of the pushing platform. One end of the depth counter cable plugs into the junction box and the other end plugs into the depth counter. The depth counter can be 1 of 2 types, a proximity switch or an encoder. If the depth counter is a proximity switch then the other end of the cable is a 4 pin male molded connector that plugs into the proximity switch. If the depth counter is an encoder, then the other end of the cable is a Multi-pin military style connector that plugs into the encoder. The encoder/proximity switch on the Datapack FCS must be set to the correct position for the type of depth device attached.

HEADLOAD/PRESSURE -The headload (clamp) and pressure switches are located on the clamp and the hydraulic handle, respectively. One end of the cable plugs into the junction box and the other end plugs into a splitter. The other end of the splitter has two connectors. The individual cables for the headload and pressure switches plug into the other end of the splitter. The coiled cable plugs into the headload switch on the clamp

and the other cable plugs into the pressure switch on the hydraulic handle.

SEISMIC -The seismic trigger boxes are either mounted on the pushing platform or are placed temporarily on the ground during a test. There may be one or two boxes, depending on the setup. If there are two boxes, then they will be plugged into a splitter cable or splitter box. The other end of this box plugs into the junction box with a cable. NOTE: The splitter box for the headload/pressure switches is not interchangeable with the splitter box for the seismic triggers.

SOLENOID -The solenoid switch will be mounted somewhere on the hydraulic system. This switch will be connected to a grey metal box. There are two other cables that come out of this box. One cable will have two conductors which go to the 12 Volt power. The other cable has a molded connector that plugs into the interface box.



Picture 1

SETTING UP THE SOFTWARE

The software will be only partially setup when the computer is shipped from the factory. There are a few

changes that need to be made by the user, such as the desired channel units.

To setup the software, start the computer and double click on the Digital Cone icon. This brings up the startup screen (figure 1).

Figure 1

Click on SYSTEM SETUP /TROUBLESHOOT. The system setup screen will appear (figure 2).

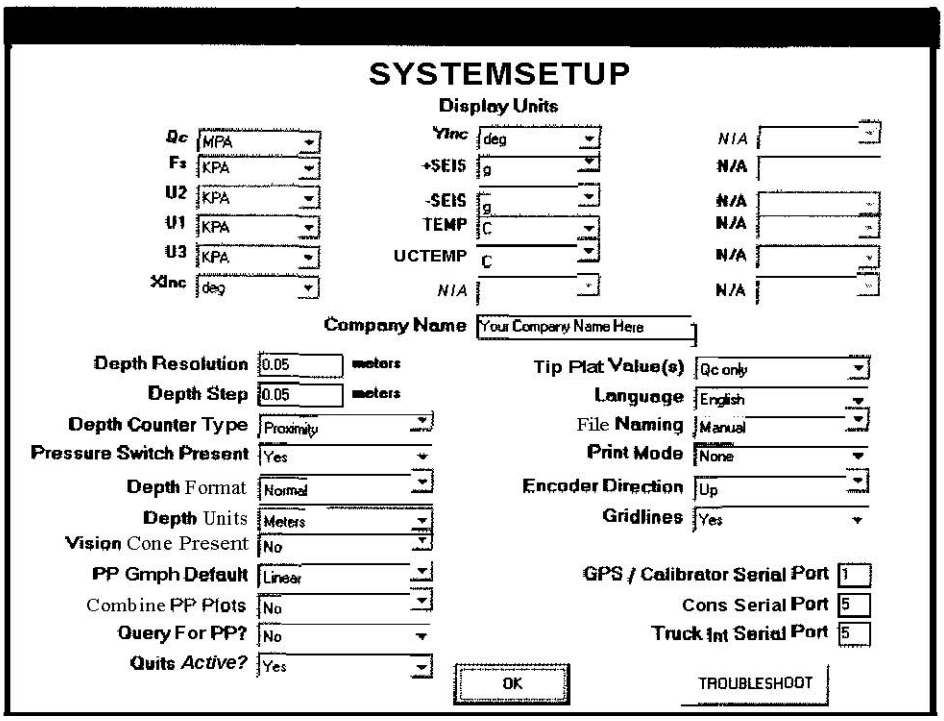


Figure 2

To change any of the settings, click on the drop-down box for that setting, if there is one, or enter the data directly if there is no drop-down box. The settings are described below:

DISPLAY UNITS -The DISPLAY UNITS are the default units that the user wishes to see the data in on the sounding screen or in Coneplot. They can be changed in a sounding file afterwards by using Cleanup. Any combination of units can be selected.

DEPTH RESOLUTION -This is the resolution of the depth counter. It is usually .05 meters (if using a proximity switch depth counter) or ,005 meters (if using an encoder depth counter).

DEPTH STEP -This is the interval at which data is stored in the sounding file. It MUST be equal to or a multiple of the DEPTH RESOLUTION. For example, if the depth counter has a resolution of .005 meters, hut the user wishes to record the data only every .05 meters, then this setting should be set to .05.

DEPTH COUNTER TYPE -There are two types of depth counters, proximity switches and encoders. Select which one is present.

PRESSURE SWITCH PRESENT -If there is no pressure switch present on the pushing platform, then set this to NO. Otherwise switch this to YES.

DEPTH FORMAT -The depth can be represented as Normal or Elevation. If it is Normal, then the depth readings increase. If it is Elevation, then the depth readings decrease. Most users choose Normal.

VISION CONE PRESENT -If a vision cone is attached, then this should be set to YES, otherwise, it should be set to NO. Most users set this to NO.

PP GRAPH DEFAULT -During a dissipation test, the time scale can be Linear or Logarithmic.

This is the format of the time for the dissipation display during the test, not the format it is stored in the file

COMBINE PP PLOTS -Some cones have more than one pressure transducer. Almost all cones have just one and therefore, this value should be set to NO.

QUERY FOR PP? -This setting will cause the program to ask the user whether he is recording U1, U2, U3 or no pressure. Set this to YES if U2 and U1 are used interchangeably.

QUITS ACTIVE? -Set this to YES to ensure that the quits are displayed on the screen and that the solenoid is activated each time a quit condition is encountered. Most users set this to YES.

TIP PLOT VALUES -The tip value displayed on the sounding screen can be either Qc or Qt or BOTH.

LANGUAGE -This should be set to ENGLISH for now. Different languages will he available in the future.

FILE NAMING -There are three different file naming systems, MANUAL, AUTO-INCREMENT, and AUTO JOB AND HOLE #. MANUAL allows the user to set the file name manually. AUTO INCREMENT increments the filename for each sounding. AUTO JOB AND HOLE # combines the JOB and HOLE numbers in the header of the file to make the filename. Whichever file naming system is used, old file's cannot be overwritten.

PRINT MODE -This function is not enabled.

ENCODER DIRECTION -Since the depth encoder can be placed in different configurations, it may be necessary to change the direction of the encoder. If the computer is showing the encoder going down instead of up during a sounding, change this value. NOTE: This setting only applies to systems with encoder switches, not to those with proximity switches.

GRIDLINES -Choose YES to show gridlines on the graphs during the soundings.

GPS SERIAL PORT -If a GPS receiver is attached to the computer, the serial port it is attached to is entered here. On most systems, it will he 1, which is the 9-pin serial port located on the back of the Computer. For information on how to attach a GPS receiver to the Computer, please contact Vertek.

CONE SERIAL PORT -This is the internal serial port the cone is attached to. This will be determined by the number that Windows assigns to the 2 internal serial ports during setup. They can be viewed in Windows' Device Manager under Ports, LPT and Com. These must be assigned numbers less than 8 for CPTSND to recognize them. If they are higher than 8 they may be changed in Advanced properties of the Port. If needed call Vertek for assistance.

TRUCK INTERFACE SERIAL PORT -This is the internal serial port the truck interface is attached to. For most systems it will be port 3 or 4. This will be determined by the number that Windows assigns to the 2 internal serial ports during setup. They can be viewed in Windows' Device Manager under Ports, LPT and Com. These must be assigned numbers less than 8 for CPTSND to recognize them. If they are higher than 8 they may be changed in Advanced properties of the Port. If needed call Vertek for assistance.

After setting up the software, press OK to return to the STARTUP SCREEN

SETTING UP A SOUNDING

Once the hardware and software are setup, it is possible to start a sounding.

Turn on the computer and click on the Digital Cone icon. Click on the START button. The computer will show the following pop-up window:

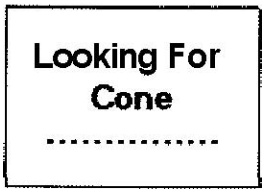


Figure 3

This window will stay up for 1 to 10 seconds. If it does not disappear after 10 seconds then check the connections, especially the cone and the power connections. Also, make sure that the power led is on as well as the inverter or the generator. If the problem persists, unplug the power supply and plug it back in.

When the computer fmds the cone, the CONE SETTINGS screen will appear (figure 4):

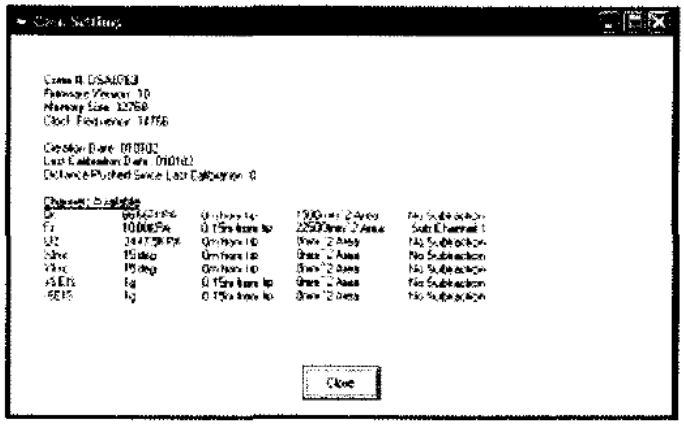


Figure 4

This screen shows the cone settings, including the cone Serial #, the cone channels and the channel capacities. The other information is for future expansion, including the distance pushed and the calibration date.

Press CLOSE to go to the next screen.

The next screen is the SOUNDING SETUP screen (figure 5).

All of the header information is entered on this screen.

All of the headers are self-explanatory and can be changed later using Cleanup.

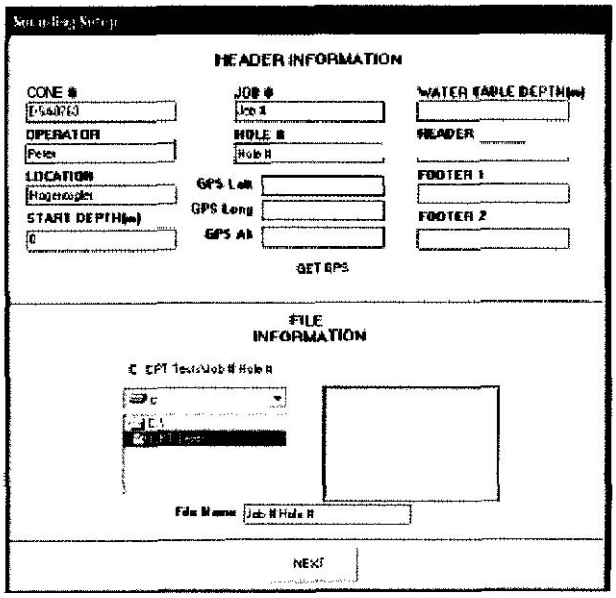


Figure 5

If a GPS receiver is attached and properly setup, then press Get GPS to acquire the GPS data. If GPS NOT FOUND is displayed, then check the setup of the GPS and the connection to the computer.

Use the drive and directory boxes on the lower half of the screen to navigate to the directory where the data is to be stored.

Enter the File Name in the File Name box. If the File Naming setting is Auto Job and Test

or Auto Increment, then the program will have chosen the file name automatically. However, the filename can still be changed manually.

Press NEXT to go to the next screen.

The next screen is the Display Setup screen (figure 6)

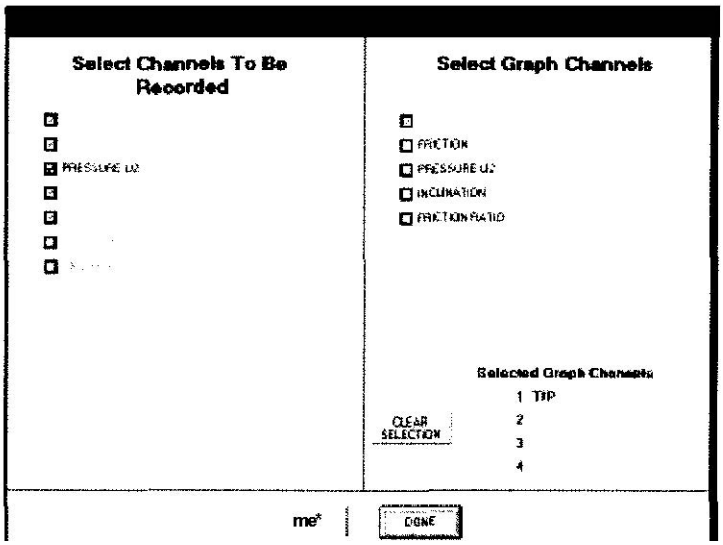


Figure 6

On this screen, the channels that are to be recorded and the channels that are to he graphed are selected.

The channels to be recorded are on the left side of the screen. Certain channels, if they **are** present, will always he recorded, such as TIP, FRICTION and X and Y INCLINATION. The check boxes for these channels will be automatically selected and cannot be un-selected. Other channels, such as pressure, are automatically recorded, but can be un-selected. If a non-pressure tip is being used, pressure should be un-selected. Finally, some channels will be automatically not recorded, but can be selected, such as Seismic. NOTE: DO NOT SELECT SEISMIC TO BE RECORDED. This is only for troubleshooting. Seismic tests can still be performed if seismic is not selected.

The channels to be graphed during the sounding are on the right half of the screen. TIP will always be graphed. All of the other channels can be graphed during the sounding. It is recommended that FRICTION, PRESSURE and INCLINATION are selected as additional graph channels. Some users prefer to look at FRICTION RATIO instead of FRICTION.

Once the recorded and graph channels are selected click DONE to go to the main screen.

PERFORMING A SOUNDING

Once the sounding setup is completed, the main sounding screen will appear (figure 7).

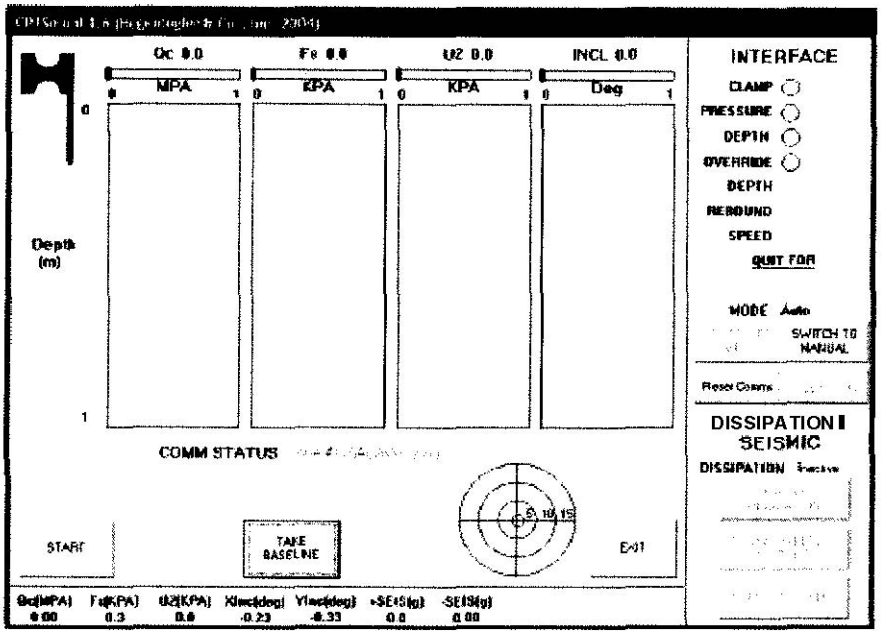


Figure 7

The graphs that were selected in the DISPLAY SETUP screen are displayed in the center of the screen. They will not display any data until it a sounding is started. The INTERFACE portion of the screen in the upper right comer shows the status of the truck interface switches. If a switch is ON then it will be green, otherwise it will be blank. Figure 7, above, shows a truck interface that is using a proximity switch for the depth counter. Figure 8, below, shows a truck interface that is using an encoder switch for the depth counter.

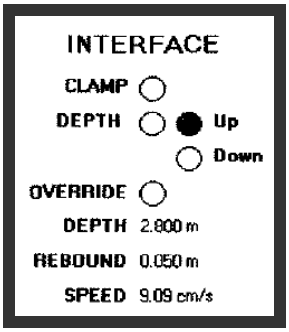


Figure 8

If the encoder shows that it is going up when it is going down, then change the ENCODER DIRECTION in the SYSTEM SETUP screen.

The bottom of the MAIN SCREEN shows the real-time values of the channels and the position of the inclinometer. The channel values are in the display units selected in the SYSTEM SETUP screen. The inclinometer position is displayed by the bubble in the yellow level. If the cone is standing up straight, then the bubble should be in the center of the level.

Click TAKE BASELINE to zero the channels. Make sure that the cone is suspended vertically off of the ground when TAKE BASELINE is clicked, to ensure that there is no load on the tip. If a clamp is used, place the cone and the first rod in the clamp and then click TAKE BASELINE. Some channels, such as the X and Y inclinometer channels do not zero when TAKE BASELINE is clicked.

TAKE BASELINE can be clicked as often as desired. Some cones take longer to warmup than others. It is advisable to click TAKE BASELINE when the MAIN SCREEN is first displayed and then wait 5 minutes and press it again. In the meantime, the cone can be placed in the clamp and the pushing platform prepared for the sounding. When the cone is ready to he pushed into the ground, click START. The MAIN SCREEN will change to that shown in figure 9.

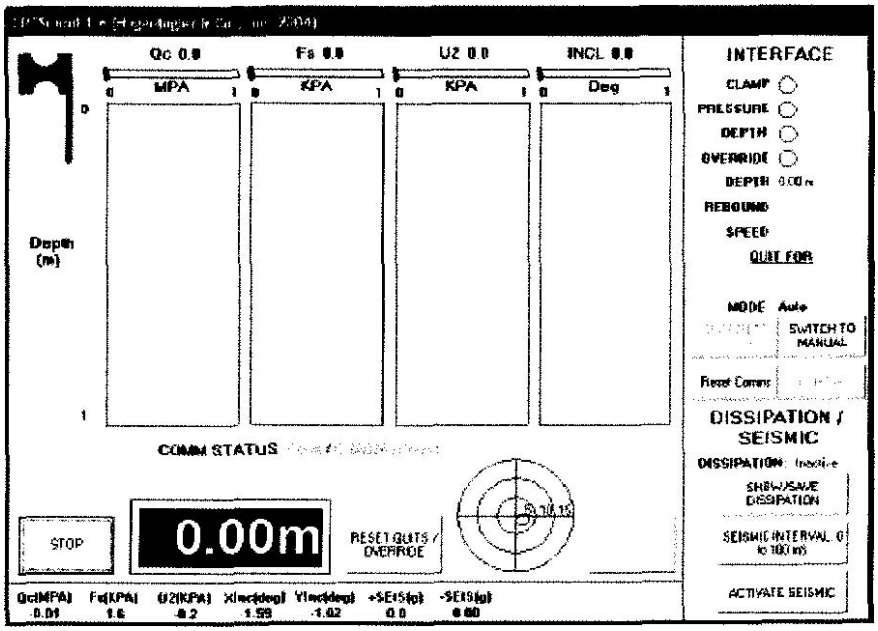


Figure *9*

The cone is almost ready to be pushed into the ground. The last step is to make sure that the interface is prepared for pushing. The following section describes the different interface configurations and the steps required to push the cone

1. Interface with proximity switch Depth Counter, Pressure Switch and Headload switch

If the interface has all three of these switches present, then nothing needs to be manually set to push the cone into the ground.

2. Interface with proximity switch Depth Counter and Headload Switch but no Pressure Switch

If the interface has a depth counter and headload switch hut no pressure switch, then the Pressure Switch Present? setting in the SYSTEM SETUP screen should be set to NO. If it is set to NO, then the pressure switch indicator on the MAIN SCREEN will always be green and nothing needs to be manually set to push the cone into the ground.

3. Interface with proximity switch Depth Counter only.

If the interface has only a proximity switch depth counter, then the SWITCH TO MANUAL and the SWITCH TO AUTO buttons must be used to push the cone. In a setup like this, the interface will be switched to Manual when pushing the cone into the ground and then switched back to Auto when the rams are retracted to grab another rod. The mode that the interface is in is indicated on the screen just above the two buttons used to switch the mode.

4. Interface with encoder Depth Counter and Headload switch.

If the interface has an encoder Depth Counter and a Headload switch, then nothing needs to be manually set to push the cone into the ground.

5 Interface with encoder Depth Counter only.

If the interface has only an encoder depth counter, then the SWITCH TO MANUAL and the SWITCH TO AUTO buttons must be used to push the cone. In a setup like this, the interface will be switched to Manual when pushing the cone into the ground and then switched back to Auto when the rams are retracted to grab another rod.

If the interface is setup properly, then it is time to push the cone into the ground. Press down on the push lever to push the cone into the ground. The depth shown in the large black box at the bottom of the screen should increase every time the depth counter turns on. If it does not, then check the interface setup. Also, the red data lines on the graphs should update every time the depth goes past the depth interval.

Figure 10 shows the MAIN SCREEN after the cone has been pushed **1.55** meters.

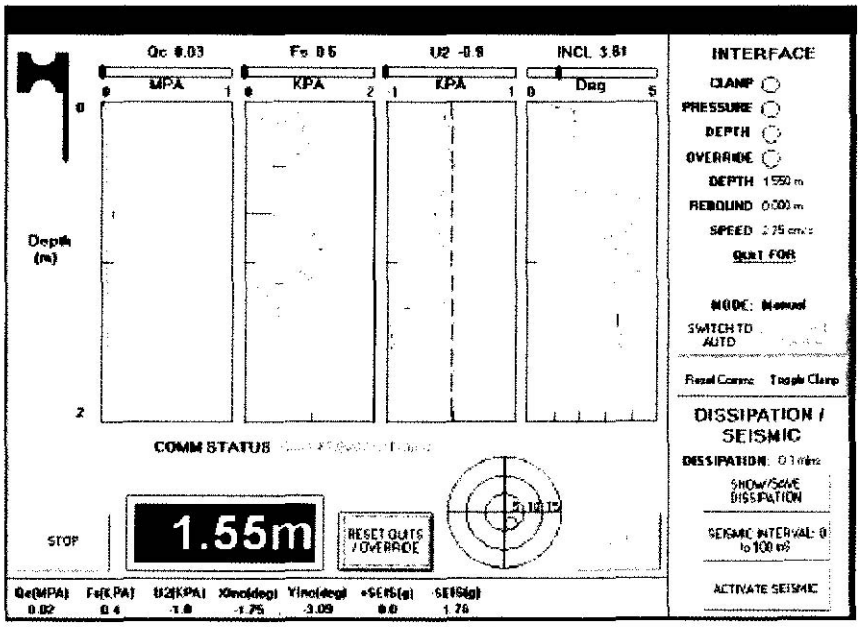


Figure 10

The data is written to the file specified in the SOUNDING SETUP screen every time the cone travels the amount specified in Depth Interval in the SYSTEM SETUP screen. For example, if the Depth Interval is **.05** meters, the program will write to the file every **.05** meters.

During the sounding, it is advisable to pay attention to a few things on the screen, such as DEPTH, SPEED, REBOUND, the live channel display, and the quits. They are explained below:

DEPTH -The depth of the sounding is displayed in 2 places: (1) in the large character depth display and (2) in the INTERFACE status display. The depth should always increase 1 meter for every rod.

If the program is being **run** in the MANUAL mode because a headload or pressure switch is missing, remember that it will need to be switched to AUTO before the ram is brought back up to grab a new rod.

If the depth increases 2 meters for every rod, the computer is probably set to MANUAL when the rams are being brought up. Make sure that the computer is on MANUAL only when the ram is going down and is on AUTO when the ram is going up.

SPEED -The speed for the sounding should be between 2 cm/sand 3 cm/s.

REBOUND -Rebound is defined as the distance the rod string travels when the pushing pressure is released. When there is no pressure, the rods might move upward if they were bent in the ground. When pressure is reapplied, the rods will bend first and then they will move downward. To prevent the counter fromrecording depth when the rods are pushed back in, the computer will record rebound if a Headload switch and a Pressure switch are present. When rebound is recorded, it should go to zero before the depth starts increasing again.

LIVE CHANNEL DISPLAY -The live channel readings are displayed on the bottom of the screen. These are important because they are the first indication of a problem with the cone. If the channels are not changing while the cone is being pushed, the truck interface power needs to be unplugged and plugged back in. If the channels continue to be frozen,call Hogentogler & Co.

The live channel display can also be the first indication that the cone is nearing a quit condition. If the cone hits a hard layer, the live display will show it first. The graphs do not reflect it until a depth reading is taken.

QUITS -If the Quits Active? setting in the SYSTEM SETUP screen was set to YES, then the computer will monitor the channels for quit conditions. A quit condition is reached when a channel reaches a certain level that has been pre-determined to be a dangerous condition for the cone. If a quit is reached, the screen will resemble the one in figure 11:

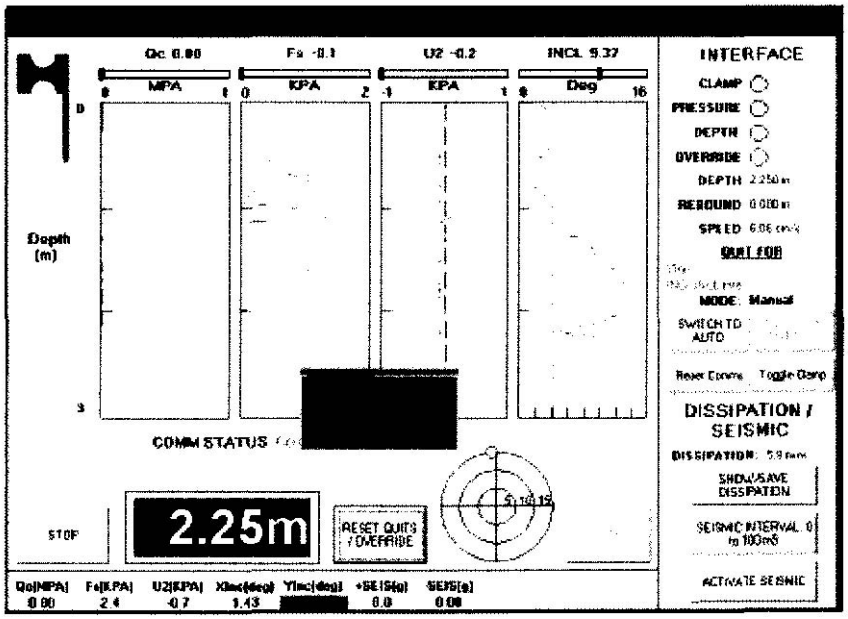


Figure 11

As seen above, a quit condition causes the computer to display a large red WARNING box, informing the user that a quit condition has been reached, and to turn off the hydraulics so that the user cannot continue, if a solenoid is installed. The channel that caused the quit is listed underneath the QUIT FOR header on the right side of the screen. The channel that caused the quit is also highlighted at the bottom of the screen.

If a quit condition is reached, but the user feels that it is safe to continue, the quit(s) can be ovemdden or reset. If the quit condition has passed, pressing RESET QUITS / OVERRIDE will remove the quit warning and reset the hydraulics. If the quit condition is still there, then pressing and holding down on RESET QUITS / OVERRIDE will override the quit condition, but not remove the warning until the condition has passed. Figure 12 shows what holding down the RESET QUITS / OVERRIDE button will display:

Figure 12

NOTE: Using the RESET QUITS / OVERRIDE button to override the quits can be dangerous. It is recommended that only those users who have enough experience with quit conditions should use this button.

PERFORMING A DISSIPATION

A dissipation test can be performed anytime during a sounding as long as the cone being used has a pressure transducer, which most cones do.

To perform a dissipation test, advance the cone to the desired depth and stop immediately after the depth is reached. Once the cone stops advancing, the computer starts recording the dissipation on the pressure transducer. To view the data, click on SHOW / SAVE DISSIPATION. This brings up the dissipation screen (figure 13).

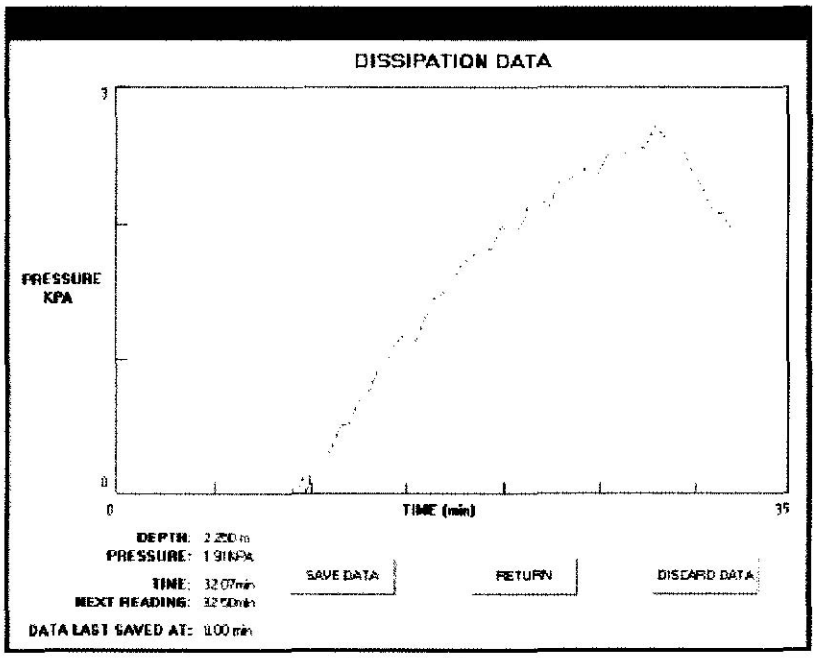


Figure 13

On this screen, the computer displays the pressure vs. time. The graph will update every second for the 1" minute, every 5 seconds for the next 4 minutes and every 60 seconds thereafter. The realtime pressure is shown on the lower left comer of the screen along with the current elapsed time, the time to the next reading, and the time at which the data was last saved.

To save the dissipation data, click SAVE DATA. This will save the data up to that point. SAVE DATA can be clicked again later to save readings that have occurred after SAVE DATA was clicked.

To return to the MAIN SCREEN, click on RETURN. This will return the user to the MAIN SCREEN, but the dissipation test will still be active. It can be viewed again by pressing on the SHOW / SAVE DISSIPATION button. It will not save the data, however. Only SAVE DATA does that.

To stop the test, either click DISCARD DATA or click RETURN and advance the cone. Once the cone has gone about .05 meters, the test will automatically restart.

STOPPING A SOUNDING

Once the desired sounding depth is reached, a quit condition is reached, or the pushing platform cannot push the cone any further, it is time to stop the test.

To stop the sounding, click on STOP on the MAIN SCREEN. This brings up the following window:

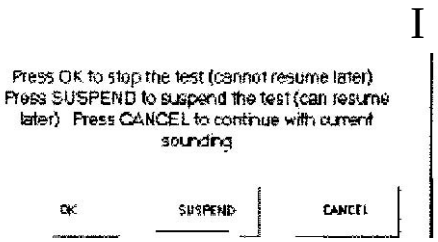


Figure 14

From this window the user can: (1) Stop the sounding by clicking OK, (2) Suspend the sounding by clicking SUSPEND, or (3) return to the sounding by clicking CANCEL.

If the user clicks OK, the computer will ask if he wants to take a final baseline or not. Only take a final baseline if the cone is completely out of the ground. Otherwise, click NO BASELINE,

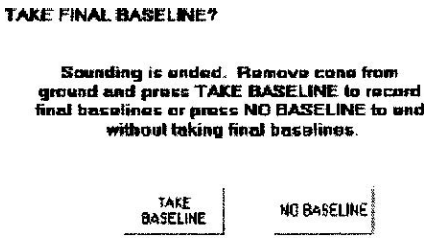


Figure 15

Once a baseline is taken or not taken, the computer will inform the user that the test is over and that the program must be restarted to perform another test. Press OK to return to Windows.

Figure 16

The sounding is now completed. The results can be viewed using Vertek Coneplot program

SUSPENDING A SOUNDING

If a sounding is being performed as in figure 10, it can be suspended instead of stopped. To suspend a sounding, click STOP on the main screen. When the window in figure 14 comes up, press SUSPEND instead of STOP or CANCEL. This will suspend the sounding. The sounding can be resumed, with the same cone, as long as another sounding is not started.

RESUMING A SOUNDING

To resume a sounding, start CPTSND by clicking on the Digital Cone Icon. When the OPENING SCREEN appears, press RESUME instead of START. The following screen will appear.

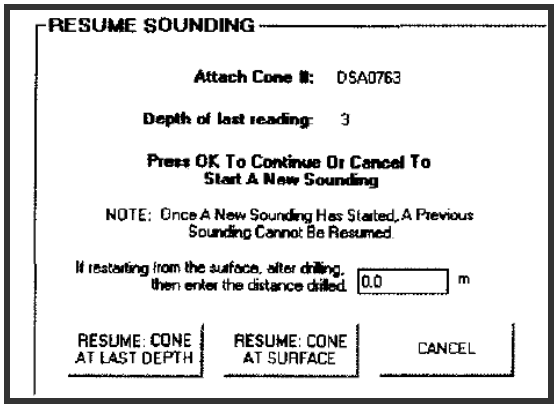


Figure 17

NOTE: The resume function can also be used if the system crashes during a sounding.

There are two options on the resume screen: (1) RESUME: CONE AT LAST DEPTH and (2) RESUME: CONE AT SURFACE. If the cone has not moved since the sounding was suspended or the program crashed, then click on RESUME: CONE AT LAST DEPTH. This is the option that will be used the most. If the cone was removed from the hole, choose RESUME: CONE AT SURFACE. This option will help the user to advance the cone back into the ground and restart the sounding at the correct depth. It is also useful if the ground has been drilled (there is a text box where the user can specify how far the soil was drilled).

Once one of the 2 resume buttons has been clicked, the computer will look for the cone and display the CONE SETTINGS screen. If another cone has been attached, the computer will not allow the user to resume the sounding.

Click CLOSE on the CONE SETTINGS screen. The program will go straight to the MAIN SCREEN and resume the sounding. There is no need to click TAKE BASELINE or START.

SEISMIC MODULE

If the system has been setup to perform seismic tests and a seismic cone is attached, then seismic tests can be performed during the sounding. The operation of the seismic module is described here, separate from the rest of the program, due to the fact that it is not standard to the system.

PHYSICAL SETUP

Before starting a sounding, it is necessary to setup the cone, the seismic trigger box and the strike plate(s).

The cone needs to be oriented before the test so that the seismic sensor is oriented towards the strike plate(s) while it is pushed. If there is more than one strike plate, then orient the cone towards one of the strike plates. If the orientation of the seismic sensor is not readily apparent, remove the tip and friction sleeve assembly to expose the strain gages. On the step between the strain gages, which are covered with electrical tape, there should be a circle with a cross in it. This indicates the orientation of the seismic sensor. Mark the orientation on the collar and put the tip and sleeve assembly back on. TIP: Once the orientation is known, take a file and mark an X on the collar. This will remove the necessity of removing the tip and sleeve on every hole to determine the orientation.

If it is not already connected, connect the trigger box to port **#3** on the interface box (the same box the depth counter, headload/pressure, and solenoid are plugged into) using the supplied cable. Place the box close to strike plate and out of the way, so that it does not get damaged. Also, place the box on a *dry* surface so that water does not get into the box. NOTE: If the interface has been installed at Hogentogler, the trigger box will have already been permanently attached to the pushing platform and does not need to be manually placed as described above.

The strike plate(s) must be positioned so that they are secure and will impart the maximum amount of shear wave force to the seismic sensor. The best place to put the strike plates is underneath the leveling jacks that are closest to the hole. When the leveling jacks are advanced downward, they will secure the strike plates in position. The strike plates can be made of wood blocks with L shaped metal brackets bolted to them, or they can be made of square metal tubing. Whatever is used, it must be capable withstanding the maximum amount of pulling force expected and large enough so that the leveling jack does not slip during the push. If the strike plate fails, the rods can be bent or the cable can he cut. NOTE: If a Hogentogler 20-ton truck is used, the one piece front leveling jack assembly makes an excellent strike plate. If a 20-ton truck is not used, DO NOT USE the leveling jacks as strike plates. This may damage the jacks.

If a strike plate is used that is not part of the pushing platform (and therefore electrically connected to it), it must be manually connected to the system electrical ground. On the seismic trigger box, there are two banana jacks. The black banana jack is connected to the system ground. A grounding cable is supplied with the system. The grounding cable has a banana plug on one end and an alligator clip on the other end. Connect one end of the grounding cable to the black banana jack on the trigger box and the other end to the strike plate.

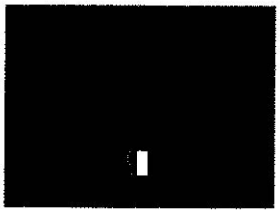
It is not necessary to plug the hammer into the trigger box at this time. In fact, it is not desirable to plug the hammer into the box until a strike is ready to be performed.

With the strike plates and cone setup correctly, start the test as described above. There are no changes to the program.

PERFORMING A SEISMIC TEST

NOTE: For the purposes of this section, it is assumed that a sounding has already been started as described above.

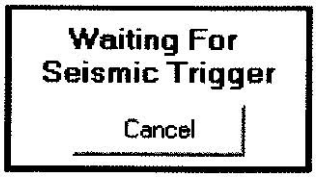
To start a seismic test, advance the cone to the desired depth and click on ACTIVATE SEISMIC. The following red window (Setting Up Seismic Channel) will appear on the main screen:



(NOTE: Before clicking ACTIVATE SEISMIC, make sure that the seismic hammer is OFF of the ground or is not plugged in. If it is on the ground, there is a possibility that the seismic channel will activate prematurely. This can cause the program to lock up.)

Some cones use accelerometers and therefore the program must remove the effect of gravity from the device before it can continue. Other cones use geophones with adjustable voltage offsets. If either of these is the case, the white offset bar will move towards the green center of the window. When it gets to the green center, the gravity or voltage offset is removed.

Once the voltage or gravity offset is removed, the program will setup the cone to receive the trigger input from the hammer. When the cone is ready to accept the trigger input, the Setting Up Seismic Channel window will disappear and the following window (Waiting For Seismic Trigger) will appear:

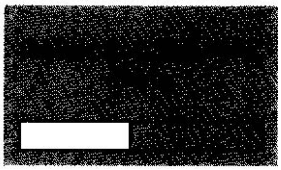


The cone and the program is now ready for the hammer strike. Plug the hammer into the trigger box, if it is not already plugged in. Then, swing the hammer against the strike plate. When the hammer is stmck against the plate, it will complete the circuit and the cone will start recording the seismic data.

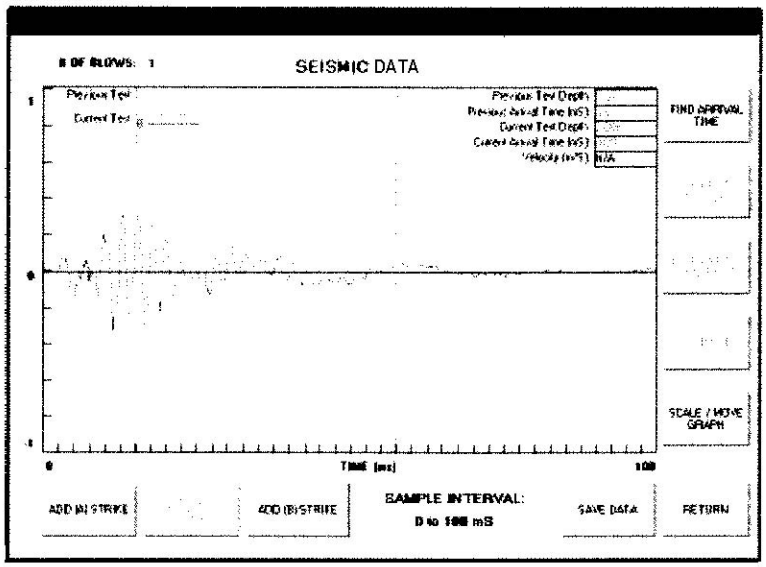
If the Waiting For Seismic Trigger screen does not disappear when the hammer is struck, check the connections. Make sure that the hammer is plugged in and that the strike plate is grounded. Also, check the connection of the trigger box to the interface box. If any of the connections are incorrect, fix the condition and strike the hammer again. If the screen does not disappear, press Cancel and activate seismic again. If the screen still does not disappear, make sure that the hammer is not left on the ground or laying on any metal that is connected to the pushing platform when ACTIVATE SEISMIC is clicked. If the ground is wet, it can prematurely trigger the seismic channel. NOTE: If the seismic channel prematurely triggers due to the hammer being left on wet ground or on a metal portion of the pushing platform, there is a possibility of the program locking up and not responding. If this is the case, press

CTRL-ALT-DEL to end the program and then use the RESUME function to go back into the program.

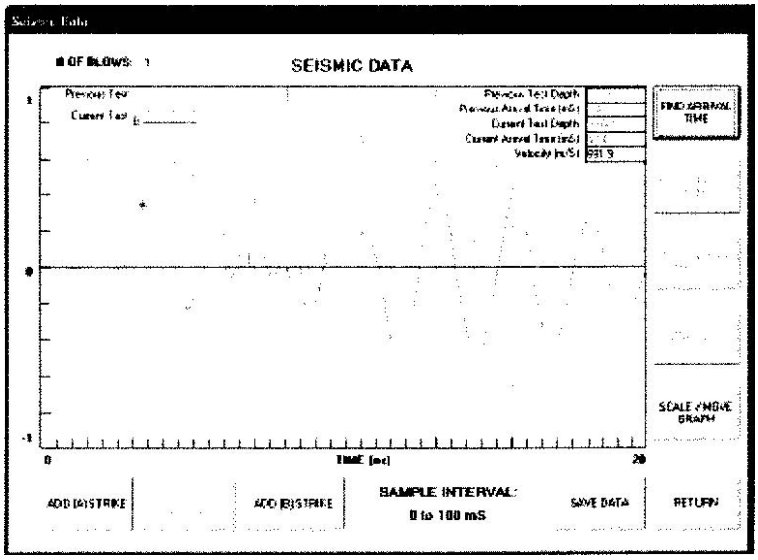
If the hammer strike is successful, the following screen will appear:



The cone is now transmitting the data to the program. The bar graph shows the progress of the **data** transmission. When the data transmission is finished, the window will close and the seismic data display window will appear with the data graph**:**



This screen shows the seismic data. The red graph is the current seismic strike. In the upper left comer of screen, are the test parameters, such as Current Test Depth and Current Arrival Time. If this is not the first test, there will also be data from the previous test, such as Previous Test Depth and Previous Arrival Time as well as another waveform from the previous test:



There are several options on this screen. NOTE: When the program is setup for Dual Axis Seismic or

Mirror Strikes, there is only one button for adding a strike instead of the two that are shown.

ADDING AN (A) STRIKE or ADDING A STRIKE

When the screen appears with the seismic data, click ADD (A) STRIKE (or ADD STRIKE if there is only one button for adding a strike) to perform another strike, even if the first strike is well defined. The purpose of this is to ensure that the fust strike was correct. The Setting Up Seismic Channel window will appear. Follow the procedure described above to perform the test. When the test is completed, the seismic data will appear on the screen as a grey graph in the lower half of the screen. At this point the new seismic **data** is considered temporary. Check the two strikes to determine that they are in phase. If they are not in phase, press DISCARD STRIKE to discard the temporary data and `try` adding a strike again. If the two graphs are still not in phase, click RETURN to go back to the main screen and redo the fust strike. This is because the first strike was probably not performed correctly.

If the two strikes are in phase, the data can be added to the original strike or discarded.

To add the new data to the original strike, click on ADD (A) STRIKE (or ADD STRIKE). The **data** will be added to the original strike. Data can be added as many times as the user wishes. Adding data removes noise from the strike. Adding strikes may be necessary when the cone is at greater depths.

ADDING A (B) STRIKE

Some customers use two strike plates, one for A strikes and one for B strikes. These strike plates are used to perform 2 opposite strikes, which can be useful for data analysis.

To add a (B) strike, at least one (A) strike needs to have been performed. This is done when the seismic channel is activated from the main screen. When the SEISMIC SCREEN appears and shows the red graph, the (A) strike has been completed (do not forget to perform at least 1 more (A) strike to make sure that the first strike was correct).

Once the (A) strikes have been completed, move the hammer to the other strike plate to perform the (B) strike(s).

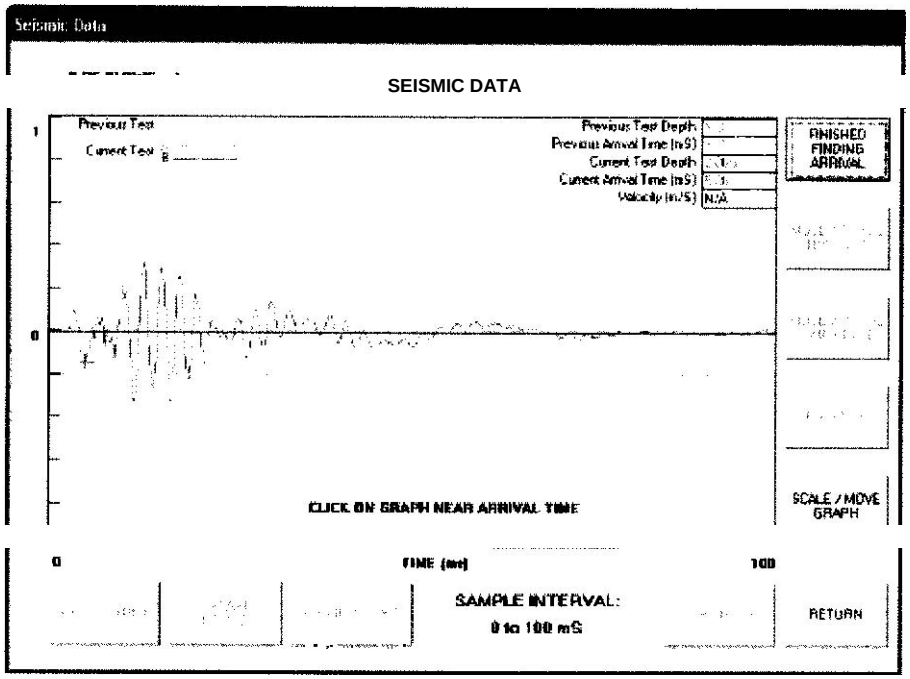
With the hammer in position, click ADD (B) STRIKE. The test is performed in the same manner as the (A) strike. The data will show on the screen as a blue waveform. If the cone was oriented correctly, the blue strike will be the opposite of the red strike.

Adding additional (B) strikes is done in the same manner as adding additional (A) strikes. Just click on ADD (B) STRIKE instead of ADD (A) STRIKE.

NOTE: If (A) and (B) strikes are being performed, make sure that each seismic test is always started on the same side. In other words, all (A) strikes should be performed with one strike plate and all (B) strikes should be performed with the other strike plate.

FINDING ARRIVAL TIME

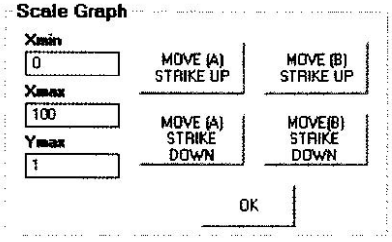
To fmd an amval time, click on FIND ARRIVAL TIME. When the button is clicked, the seismic screen will prompt the user to click on the graph near the arrival time:



Click on the graph near the arrival time. A cross-hair will appear on the waveform. Use the MOVE ARRIVAL TIME LEFT and MOVE ARRIVAL TIME RIGHT buttons for fine placement of the cross- hair. Click on FINISHED FINDING ARRIVAL when the arrival time is determined.

SCALING OR MOVING THE GRAPH

To scale or move the graph, click on the SCALE/MOVE GRAPH button. The following window will appear:



The graph can be scaled to make it easier to pick the arrival time. Change the values in Xmin/Xmax/Ymax to change the scale of the graph.

The **(A)** and (B) strikes can be individually moved up or down. The purpose of these buttons is to allow the user to manually center the waveform(s).

After making the changes, press OK to return to the Seismic Screen. NOTE: The scaling is not saved when the seismic `data` is saved, but the change made to the waveform(s) vertical position(s) is.

SAVING THE SEISMIC DATA

The seismic data can be saved by clicking the SAVE DATA button. This will save the data and return the user to the main screen. DO NOT CLICK this button until the data is satisfactory. Once the data is

saved, clicking on ACTIVATE SEISMIC on the main screen (without advancing the cone downward) will result in a new seismic test being performed at the same depth.

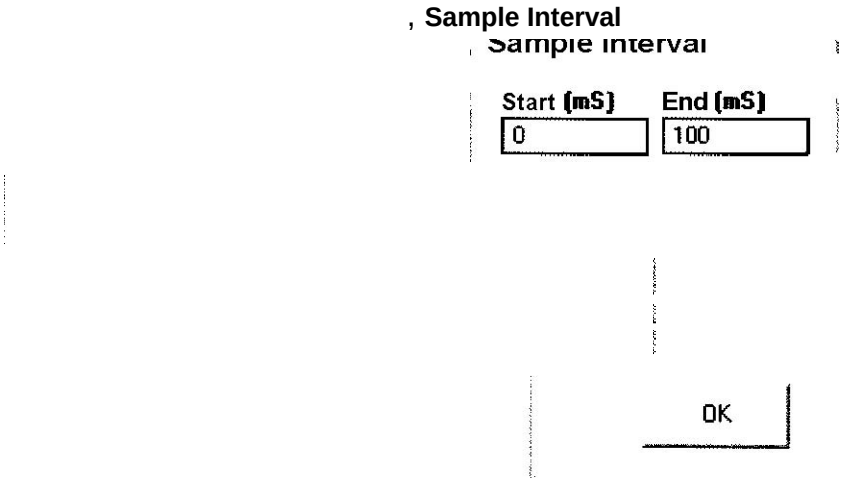
NOTE: Make sure to click SAVE DATA to save the seismic data. If RETURN is clicked instead, ALL of the data is discarded by the program. The purpose of the RETURN button is to allow the user to discard the data if a bad first (A) strike or a bad first (B) strike is recorded.

CHANGING THE SEISMIC INTERVAL

The seismic channel can read up to 400 milliseconds of data after the hammer strike. The default, however, is set to 100 milliseconds, to reduce the amount of time required to transmit the data back to the program.

If the sounding goes deep, the seismic interval may have to be increased in order to "catch" the relevant data. The decision is left up to the operator, who must decide whether to increase the interval by looking at the waveform in the seismic screen. If the seismic wave (the portion of the waveform with the defined peaks and valleys) starts in the last 1/4 of the graph, it is advisable to increase the interval for the next test.

The interval can only be increased from the main screen. To increase the interval, click on the SEISMIC INTERVAL button (which also displays the current interval setting). The following screen will appear:



Change the Start or End times by entering whole numbers into their respective boxes and clicking OK. The numbers represent milliseconds. NOTE: Most users, when they have to increase the sample interval, change only the End time and leave the Start time at **0.** This ensures that any pertinent data at the front of the waveform is recorded.