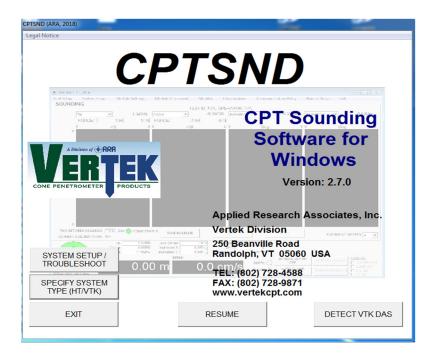




# **VTK Series CPTSND Software Manual**

For use with VTK DataPack 2010 or VTK 2011 Modular DataPack system











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## 1. SECTION I

#### 1.1. Introduction

The VERTEK DataPack System is an advanced platform for the acquisition of Cone Penetrometer (CPT) data. The system allows the user to perform CPT tests with minimal effort and learning. The CPTSND software was designed to give the operator maximum feedback from the cone in a simple, readable format.

This manual is to be used as a guide to allow the user to set up and use the Vertek Datapack System and CPTSND software for the acquisition of 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 ASTM standards is beyond the scope of this manual.

- 1.2. System Requirements
  - Laptop computer running Windows 7 (64 bit PRO edition recommended)
  - Compatible with newer versions (Windows 8.1 & 10 may require additional drivers)
  - CPTSND Software for the laptop
  - VTK DataPack system, (Suitcase or Modular version--See the front cover)
  - Figure 1 Speed Lock One Meter Rods
  - Figure 2 CBL-0030-50M Cable Assembly
  - Figure 3 4444 Cone Assembly Or Other
  - Figure 4 2537 Depth Transducer Pictured is a string pot
  - Figure 5 1074 Depth Transducer Cable assembly
  - Figure 6 HT-0595 Power Supply
  - Figure 7 Rod Push/Pull System Figure
  - Other components may be included as ordered



Figure 1 Speed Lock One Meter Rods



Figure 3 4444 Cone Assembly Or Other



Figure 5 1074 depth cable assembly



Figure 2 CBL-0030-50M Cable Assembly



Figure 4 2537 Depth Transducer



Figure 6 HT-0595 power supply



Figure 7 Rod Push/Pull System -- Universal Push System Shown

## 2. SECTION II

## 2.1. SOFTWARE INSTALLATION

The DataPacks in the VTK series of equipment have an internal storage card that has the installation software package loaded on it. If loading from this device plug in the USB cord and proceed as below.

If using the installation CD provided then there is no need to connect the DataPack USB cord to computer until instructed.

Current versions of VERTEK software for CPT are available on our website (www.vertekcpt.com)

With the USB Cable unconnected, insert the Vertek software installation disk into the laptop disk drive. When prompted open the main folder. Select "Double click to install programs.rtf" then follow the instructions. For computers that cannot open .rtf files use the .html file of the same name.

To install the programs directly follow these instructions.

- 1. Double click on the "CPTSND.exe" program and follow the prompts.
- 2. Check the box to make a desktop icon then click "Next".
- 3. In the next prompt box click "Install".
- 4. After the installation the next prompt appears with a checked box to launch the CPTSND software, un-click the box.

Next click on the "Coneplot installer.exe" program.

- 1. When the install wizard appears click "Next".
- 2. Click "Next" at the following two prompts as well.
- 3. At the next prompt click the "Create icon" box then click on "Next".
- 4. At the next prompt click "Install" and wait for the next prompt.
- 5. At the last prompt un-click the "Launch" box and return to CD drive window.

It is recommended to also copy the manuals folder to the computer used for data collection for operator reference.

If the hard drive space is available, copy the entire CD to a backup folder. There is also a backup copy of the software disc on file in the DataPack.

NOTE: Direct installation of the programs alone may not work on all computers as our software requires certain background programs to be on the computer; standard versions of these are on the installation disc. (Dot Net is required, as is Measurement Computing's INSTACAL, along with drivers for the serial devices) Some computers may require downloading correct versions of these in order to operate.

#### 3. SECTION III

#### 3.1. SERIAL PORT HARDWARE SETUP

The laptop is now ready to connect to the DataPack system via the USB cable. See section IV for system wiring connections. The Wizard screen below or a similar one will appear depending on the version of operating system, Figure 8 Hardware Wizard Screen. This may take several minutes as Windows finds the new devices.



Figure 8 Hardware Wizard Screen

- 1. The following screen will appear. Select "Install from a specific location" option, Figure .
- 2. Select "Next".

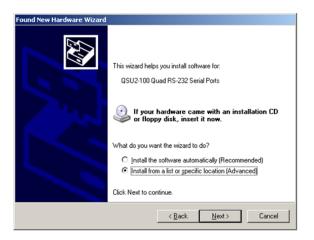


Figure 9 Software Install Choice

3. Select the search option as shown in Figure then click Next

4. Figure // shows search installation options. Check both boxes and browse to the location the installation disc is inserted into.

ease choo	ose your search and installation options.
	h for the best driver in these locations.
	e check boxes below to limit or expand the default search, which includes local and removable media. The best driver found will be installed.
	Search removable media (floppy, CD-ROM)
1	Include this location in the search:
	E:\new HT jun 2012\Windows 2000, XP, Vista Quat  Browse Browse
C Don't	search. I will choose the driver to install.
	e this option to select the device driver from a list. Windows does not guarantee t ver you choose will be the best match for your hardware.

Figure 10 Search Installation Options

5. The following screen (Figure 11) will show up informing you that the serial port hardware has been successfully installed. Select "Finish"

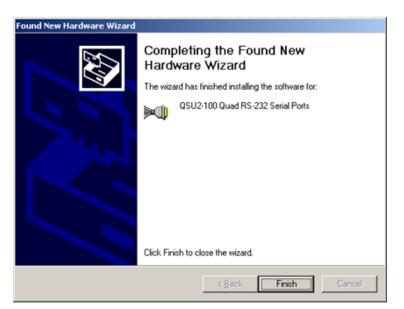


Figure 11 Installation Complete

## 4. SECTION IV

## 4.1. SYSTEM HARDWARE SETUP

Setting up the acquisition system is simple. There is only one USB connection to the computer, see pictures below for basic systems connections:

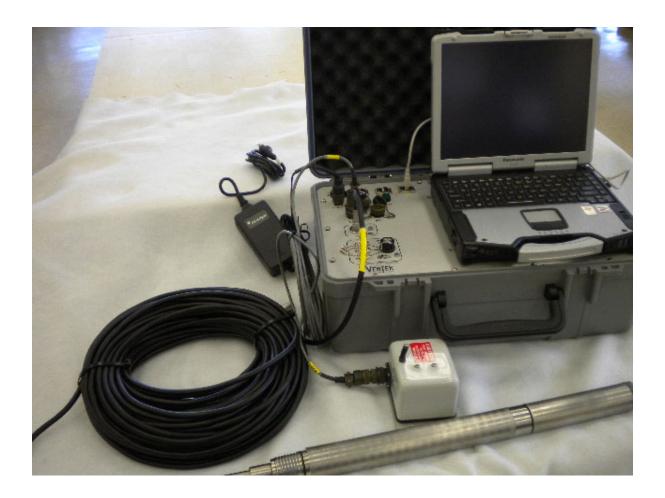
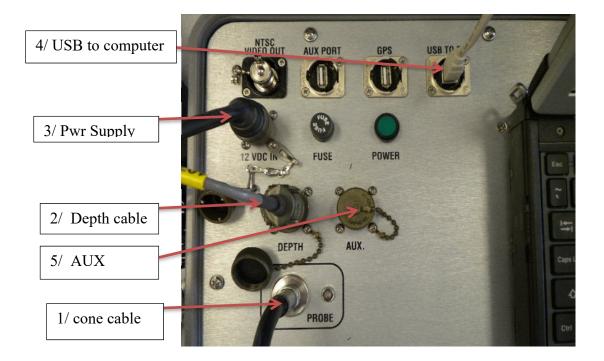


Figure 12 Picture of DATAPACK 2010SV with depth, cables and cone



#### 4.1.1 Standard connections for DATAPACK 2010SV

Figure 13 VTK Datapack 2010SV Connections

- 1. The CPT cone cable (CBL-0030-50M or equivalent) plugs into the 'PROBE' receptacle. The other end is strung through the rods and connected to the appropriate cone (4444 or equivalent)
- 2. The Depth Cable Assembly (1074 or equivalent) is connected to the 'DEPTH' receptacle. The other end is connected to the depth transducer (2537 or equivalent)
- 3. The HT-0595 power supply is connected to the '12VDC IN' receptacle. The other end is connected to the appropriate AC power supply source.
- 4. The USBA to USBB cable is plugged into the 'USB TO PC' receptacle. The other end is connected to an open USB port on customer supplied computer.
- 5. The 'AUX' receptacle is used for peripheral devices like load cells or other optional equipment.

4.1.2 Standard connections for the Vertek Modular DataPack 2011 system (ENCL-0025 used with Connector Hub ENCL-0026):



Figure 14 Basic VTK Modular System



Figure 15 Front Connections ENCL-0025



Figure 17 Cone Cable and Datapack Cable to Connector Hub ENCL-0026



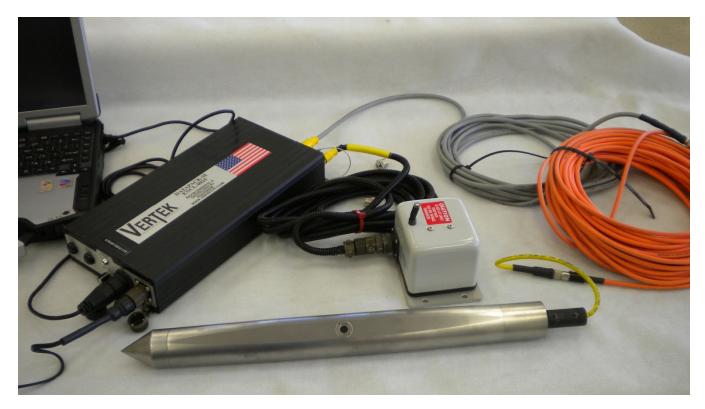
Figure 16 Rear Connections ENCL-0025



Figure 18 Depth Transducer

- 1. The CPT cone cable (CBL-0030-50M or equivalent) plugs into the 'CONE' receptacle on the connector hub. The other end is strung through the rods and connected to the appropriate cone (4444 or equivalent)
- 2. The Connector Hub Cable (35544) is connected between the 'CONNECTOR HUB' receptacle on the ENCL-0025 and the 'DATAPACK' receptacle on the Connector Hub (ENCL-0026)
- 3. The Depth Cable Assembly (1074 or equivalent) is connected to the 'DEPTH' receptacle on the Connector Hub. The other end is connected to the depth transducer (2537 or equivalent)
- 4. The HT-0595 power supply is connected to the '12VDC IN' receptacle. The other end is connected to the appropriate AC power supply source.
- 5. The USBA to USBB cable is plugged into the 'USB TO PC' receptacle on the ENCL-0025. The other end is connected to an open USB port on customer supplied computer.
- 6. The 'AUX' receptacle is used for peripheral devices like load cells or other optional equipment.

Connections for video and seismic will be discussed in the appropriate sections.



4.1.3 Connections for DataPack Modular System (ENCL-0025 without Connector Hub):

Figure 19 ENCL-0025 Modular DataPack used without Connector Hub

1. In this application the cone used plugs directly into the 'CONNECTOR HUB' receptacle on the ENCL-0025. Shown in figure 19 is a Specialty Module that connects to an orange cable which

then connects to adaptor cable # CBL-0180 which connects to the 'CONNECTOR HUB' receptacle. (NOT SHOWN-- For the "Mini Cones" the cables are 3185 and CBL-0141)

- 2. The Depth Unit (2537) connects to the Depth Cable (CBL-0150-15FT) which plugs into the 'DEPTH' receptacle on the ENCL-0025.
- 3. The power supply and the USB cable connect as for the standard modular system.



Figure 20 Rear Connections for DataPack without connector hub

#### 4.2 SETTING UP THE SOFTWARE

The software has system specific use preferences that will initially 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 CPTSND icon. This brings up the main screen as shown in Figure 21

	CPTSND
<ul> <li>VERTER CP1, 2014</li> <li>List Schup — System Schup — Mich</li> </ul>	Lik Sellings Michike Parriant Michike Chrosinalian Cremenication (Micy Ram Schrigs Had
4 0 HR	Software for
A Division of CARA	- Windows
	Version: 2.7.0
	Applied Research Associates, Inc.
0 THE BETWEEN READNOS 13, See CURRENT SCIE BEFAVIOR, 1974	
SYSTEM SETUP / TROUBLESHOOT	Index         Index <th< td=""></th<>
SPECIFY SYSTEM TYPE (HT/VTK)	FAX: (802) 728-4588 FAX: (802) 728-9871 www.vertekcpt.com

Figure 21 CPT SND Software Main Screen

Click on SYSTEM SETUP. The system setup screen will appear as shown on next page in Figure 22.

Since this manual deals with the VTK series the "Specify System" button is not used. If the setup screen has been completed previously the settings are saved. Click on the "DETECT VTK DAS" button and skip to figure 29 on page ??

SETUP								A A
SetQuits Display Settings				tion	DETE	CT ON STARTUP		DEPTH UNITS O meters O feet
SETUP WOD	ULE:   5-5		STATUS: N/A	_	DETE			
CHANNEL NAME CHANN		IEL UNITS	SIG. DIGITS	DISPL	AY DATA		<u>RECORD</u> CHANNEL	DEPTH TRANSDUCER SN 0 O ENCODER/DIO CLAMP
Тір	TSF	•	2 💌	⊙ YES	O NO	$\overline{\mathbf{A}}$	$\checkmark$	DEPTH COUNTER TYPE O ENCODER/DAS CLAMP @ POTENTIOMETER
Sleeve	TSF	•	2 🔹	⊙ YES	O NO	$\checkmark$	$\checkmark$	ENCODER DIRECTION Down
Temperature	F	•	0 💌	⊙ YES	O NO		$\checkmark$	ENCODER RESOLUTION 5 mm/step
Pore Pressure	PSI	•	2 💌	⊙ YES	O NO	$\checkmark$	$\checkmark$	POTENTIOMETER OUTPUT
Exc Sense	V	•	2 •	⊙ YES	O NO		~	SET DEPTH (0 m) 1.15192
Inclination X	Deg	•	2 •	⊙ YES	O NO	$\checkmark$	$\checkmark$	SET DEPTH (1 m) 0.39651
Inclination Y	Deg	•	2 •	⊙ YES	O NO	$\checkmark$	$\checkmark$	CLAMP CONFIGURATION Normally Open
HFFD	V	•	2 •	⊙ YES	O NO		$\checkmark$	SOUNDING RECORDING MODE O TIME BASED O EPTH BASED
LFFD				⊙ YES	O NO	-		DEPTH INCREMENT 20 mm
	V	•	2 🔹			_	_	TIME INCREMENT 1 second
N/A		~	0 👻	O YES	⊙ NO			DEPTH FORMAT Normal
Friction Ratio	%	•	2 👻	⊙ YES	O NO			MODULE SERIAL PORT
SPT-N		•	2 👻	<b>⊙</b> YES	O NO			GPS SERIAL PORT N/A AUTO DETECT ASCII-OUT SERIAL PORT N/A SCII-OUT SERIAL PORT
Soil Behavior Type	ZONE	-	0 -	⊙ YES	O NO			ASCII-OUT SERIAL PORT N/A  ENCODER SERIAL PORT N/A  ENCODER PORT
COMP	ANY NAME	VERTEK			(	QUITS ACTIVATED	Yes	*.DAT FILE FORMAT Coneplot
TIP PLO	T VALUES	Qc only	•		SOIL	BEHAVIOR CHART	R & C - 198	FILE NAMING Auto-Increment
PP GRA	PH STYLE	Linear	•		ON-S	CREEN HEADER 1	Test ID	▼ VIDEO RECORDING MODE None (no frame grabber) ▼
AUTO-ENHANC	E SEISMIC	No	•		ON-S	CREEN HEADER 2	Operator	AUTO-SAVE DISSIPATION No
AUTO-FILTE	R SEISMIC	No	•		VIDEO O	VERLAY (DEPTH+)	Depth Only	SAVE SCREEN SIZE ON EXIT Yes
SHOW C	GRIDLINES	Yes	•			SAVE	CANCEL	ADD TRB AND TMP FILES Yes 🔹

Figure 22 System Setup Screen

To change any of the settings, click on the drop-down box for that setting or enter the data directly if there is no drop-down box. The settings are described below: (NOTE: cone module 1 is for a non seismic cone and cone module 5 is for a seismic cone)

The SET UP MODULE area on the upper left side can be pre-set at the office. To ensure that the actual configuration is correct for modules found during set up it is best to verify the module set up section prior to testing. These settings will set up the display to work in the units desired. Take baseline and record channel are musts for some modules and therefore are grayed out.

DETECT ON STARTUP Selecting yes for only the cones/modules being used will speed up the search time considerably by having the system only look for the items being used. See figure 23.

SETUP MODULE: 1 - CONE			•		DETECT ON STARTUP				DEPTH UNITS	S ⊙ meters O feet		
			STATUS:	N/A		TAKE	RECORD		DEPTH TRANSDUCER SN	0		
CHANNEL NAME	CHANN	NEL UNITS	SIG. D	IGITS	DISPLAY DATA	BASELINE	CHANNEL		×		DIO CLAMP	
Tip PSI		•	3	G DEFECT ON STARTUP			E O ENCODER/DAS CLAMP © POTENTIOMETER					
Sleeve	PSI	•	2	•	e SELECT W⊢	G SELECT WHICH MODULES WILL BE DETECTED ON STARTUP		ENCODER DIRECTION	Up	•		
Side Temp	C	•	2	•	MODUL     MODUL	E: 1 - CONE			ENCODER RESOLUTION	5	mm/step	
Pore Pressure	PSI	•	2	•	MODUL	E: 2 - SMP/RES	S		POTENTIOMETER OUTPUT			
Excitation Sense		_			MODUL	.E: 3 - DATAPAC	Ж		SET DEPTH (0 m)	0.17898 3.16852		
Inclination X	V Deg	<u>·</u>	2	• 		.E: 4 - DIGITAL .E: 5 - SEISMIC			SET DEPTH (1 m)			
	Deg	•	11	•		E: 6 - FFD			CLAMP CONFIGURATION	Normally CI	osed -	
Inclination Y	Deg	•	1	•		E: 7 - COUNTE			SOUNDING RECORDING MODE			
HFFD	V	•	1	✓ G MODULE: 8 - CAMERA MODULE: 9 - MULTI-SLEEVE								
LFFD	V	•	1	•			LEEVE		DEPTH INCREMENT		mm	
	-			_			TIME INCREMENT	1 second	<b>*</b>			
N/A		Ψ.	0	~	9	.E: 12 - N/A			DEPTH FORMAT	Normal	•	
Friction Ratio	%	•	2	Ŧ		E: 13 - N/A			MODULE SERIAL PORT	N/A -		
SPT-N				_	D MODULE: 14 - COLOR PROBE		GPS SERIAL PORT	N/A -	AUTO DETECT MOD	וה		
3F 1-N		•	2	Ψ	MODUL	.E: 15 - N/A			ASCII-OUT SERIAL PORT	N/A -	AND ENCODER PC	_
Soil Behavior Type ZONE		-	0	Ŧ		.E: 16 - N/A			ENCODER SERIAL PORT	N/A -		_
COMP	ANY NAME	VERTEK				.E: 17 - N/A .E: 18 - N/A			*.DAT FILE		oneplot and ProDAT	-
TIP PLO	OT VALUES	Qc only		•		.E. 10 - N/A .E: 19 - N/A			FIL		uto-Increment	
PP GR.	APH STYLE	Linear		•		.E: 20 - N/A			VIDEO RECORD		one (no frame grabber)	-
AUTO-ENHAN	CE SEISMIC	No		•					AUTO-SAVE DIS		0	-
	ER SEISMIC			•		Oł	(		SAVE SCREEN SIZ			-
	GRIDLINES								ADD TRB AND	-		_

Figure 23 Detect On Startup

On the upper right side are the depth transducer selection and settings. First is DEPTH UNITS, where the choice is made to display meters or feet. DEPTH TRANSDUCER SERIAL is just a location to note serial number and is stored for future reference.

DEPTH COUNTER TYPE- Select either POTENTIOMETER or ENCODER depending on your system. (The encoder requires a small additional USB circuit and will connect directly to the computer) The potentiometer cannot be set up (the black readouts next to 0 M and 1 M) until the system is connected and communicating and will take place the first time a test is run (see Sect 5).

ENCODER/DIO Clamp checked -- causes system to ignore the clamp switch – requires operator to manually cycle clamp indication to record data.

ENCODER/DAS Clamp checked – allows the system to collect data automatically using auto clamp active feature

If either ENCODER choice is selected the settings must be entered at this time. These settings cannot be changed after detecting the VTK DAS. Choose direction (UP or Down) in ENCODER DIRECTION to ensure that depth increments properly during test (depends on how the unit is mounted). Select the number

of millimeters of travel that the encoder makes per step in ENCODER RESOLUTION. This is important so that indicated depth matches actual depth!!! (encoders supplied by Vertek use a nominal 5 mm setting and this setting can be fine-tuned out to three decimal places to ensure accuracy.)

CLAMP CONFIGURATION This setting allows the software to accept either normally open or normally closed switches used to indicate clamp position. With no switch present the selection has no effect.

Then select either DEPTH INCREMENT or TIME INCREMENT. Depth Increment must be the same as, or a multiple of, the ENCODER RESOLUTION selected. The Time Increment choice is either continuous or 1 second. In continuous the interval is as close as possible limited by the TIME BETWEEN READINGS rate seen on the testing screen.

The increment setting determines the interval between data capture points during CPT push. Most users use 2 or 5 cm in depth or 1 second in time

On the set up screen there are four tabs in the top tool bar; one for 'Set Quits', one for 'Display Settings', one for 'Default Dissipation Mode', and one for 'Ball Tip Area Calculation'. See Figure 24.

The Display Settings are drop down menus, Mode is "indoor / outdoor" which simply changes the background for the push screen graphs between black and white. The other drop choices on 'Display Settings' allow the operator to select heavier or thinner graph or grid lines to aid in visibility during push.

SETUP		
SetQuits Display Settings Default Dissi	oation Mode Ball Tip Area Calcula	tion .
SETUP MOD	JLE: 1 - CONE	-
		STATUS: N/A
CHANNEL NAME	CHANNEL UNITS	<u>SIG. DIGITS</u>
Тір	PSI	3 -
Sleeve	PSI	2 •
Side Temp	c .	2

Figure 24

SETUP							
SetQuits	Display Settings	Default Diss	sipati	on M	lode	Ball Tip	Area Calcula
	Mode		>	~	Indo	or	
	Data Line Th	hickness >		Out	tdoor		
	Grid Line Th	ickness >					
	HANNEL N	AME			<u>СН</u>	ANN	

Figure 25 Display Settings

The Set Quits screen allows setting of the quits to a percentage of the cone rating or to a specific setting for each channel. A zero setting will result in no quits being generated. Quits can be entered differently for the start of a push (less than 5 meters) and for the remainder of the push (greater than 5 meters).

SET QUITS	r =	ENCODER							
CHANNEL QUIT LEVEL (% OF CHANNEL CAPACITY OR ABSOLUTE VALUE): ENTER 0 FOR NO QUITS									
MODULE NUMBER 1 - CONE									
	DEPTH < 5m	DEPTH > 5m							
Тір	0 v O PSI	0 v 0 PSI							
Sleeve	0 v or 0 PSI	0 v or 0 PSI							
Side Temp	0 or 0 N/A	0 or 0 N/A							
Pore Pressure	0 v 0 PSI	0 v 0 PSI							
Excitation Sense	0 or _0 N/A	0 or 0 N/A							
Inclination X	0 v O Deg	0 v O Deg							
Inclination Y	0 v O Deg	0 💌 or 0 Deg							
HFFD	0 v 0 N/A	0 - 0 N/A							
LFFD	0 v O N/A	0 _ or 0 N/A							
N/A	0 v O N/A	0 _ or 0 N/A							
	SET QUITS CANCEL								

Figure 26 Quit Settings

**NOTE:** The settings on this page work in conjunction with the channel capacity settings on the module delay screen. Without channel capacity set, channel quit level settings will be irrelevant.

The Default Dissipation Mode allows user to choose continuous readings or dynamic. The continuous mode will make a very large file quickly and should be avoided when dissipations are expected to last a few hours. The One Second mode will take a reading each second (creating about one third the file size of the continuous) The dynamic mode takes readings at increasing intervals to accommodate long test cycles.

SETUP		
SetQuits Display Settings	Default Dissipation Mode	Ball Tip Area Calculation
SETUP MODU	Interval 🕨	One Second Interval DETECT ON
	Continuous	V Dynamic Interval
CHANNEL NAME	CHANNEL UNITS	SIG. DIGITS DISPLAY DATA B

Figure 27 Dissipation Mode Selection

The Ball Tip Area Calculation simply allows choice on area of ball tip entered into calculations – entire area or half sphere area.

SETUP	_	Common and				-
SetQuits	Display Settings	Default Dissipation Mode	Ball Tip Area Calculat	tion		
	SETUP MODU	JLE: 1 - CONE	Cross Sectional	Area	DETECT	ON :
		,	Half Sphere Are	a		т
СНА	NNFI NAMF	CHANNEL UNITS	SIG. DIGITS	DISPI AY I	ΔΑΤΑ	RA

Figure 28 Ball Tip Area Selection

## 4.3 PORT SETTINGS

CPT SND now will determine what ports the data system has been assigned and will search for the selected modules simply by clicking on DETECT VTK DAS (see fig 21)

The following information is for reference purposes and troubleshooting. If the system is found (see figure 36) by clicking DETECT VTK DAS then skip to system set up on page 23.

The DAS Serial Port can be on any COM port (COM4 is shown in our example below figure in Device Manager -- USB serial port (COM4) and SSU2-100 device listed in multiport adaptors) Renaming ports should not be necessary. Additional devices will be assigned as detected.

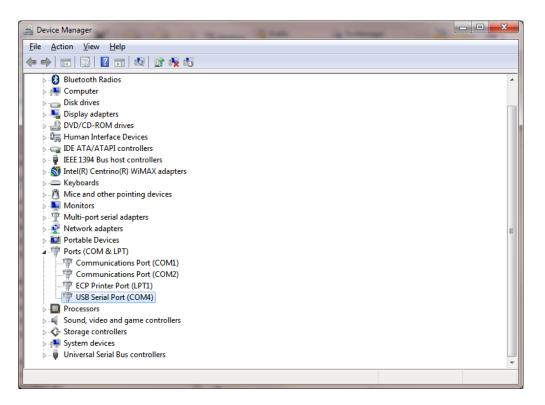


Figure 29 Device Manager Screen

The AUTO DETECT MODULE AND ENCODER PORT button (see figure 22) will start a search for the DAS and display this:

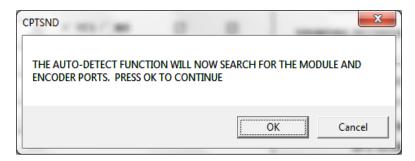
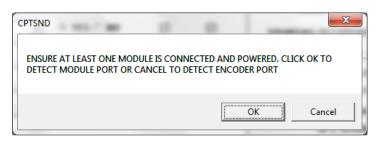


Figure 30 Auto-Detect notice

## Figure 31 Detect Encoder notice



SETUP			100 C							
SetQuits Display Settings										
SETUP MOD	ULE: 5 - S	EISMIC CON	E 💌		DETE	CT ON STARTUP			DEPTH UNITS	O meters <ul> <li>feet</li> </ul>
			STATUS: N/A	1		TAKE	RECORD		DEPTH TRANSDUCER SN	0
CHANNEL NAME	CHANN	IEL UNITS	SIG. DIGIT	S DISPLA	Y DATA	BASELINE	CHANNEL			O ENCODER/DIO CLAMP
Тір	TSF	<b>_</b>	2 -	1		$\checkmark$	×		DEPTH COUNTER TYPE	<ul> <li>○ ENCODER/DAS CLAMP</li> <li>○ POTENTIOMETER</li> </ul>
Sleeve	TSF	-	2 -	] ⊙ YES	O NO	$\checkmark$	$\checkmark$		ENCODER DIRECTION	Up 💌
Temperature	F	•	2 🗸	● YES	C 10				ENCODER RESOLUTION	5 mm/step
Pore Pressure	PSI	-	2 -	● YES		CHECKI		_	POTENTIOMETER OUTPUT	
Exc Sense	V	•	2 -	● YES		VERTEK			SET DEPTH (0 m)	0.17898
Inclination X	Deg	•	2 •			ON PC	DRT 4		SET DEPTH (1 m)	3.16852
Inclination Y					-				CLAMP CONFIGURATION	Normally Closed
HFFD	Deg	-	2	CPTSND	0.80		-		NG RECORDING MODE	O TIME BASED ⊙ DEPTH BASED
	V	•	2	VERTEK MOI	DULE(S) DE	ETECTED ON PORT 4	. CLICK OK TO E	DETECT ENCODER	DEPTH INCREMENT	20 mm
LFFD	V	-	2	PORT OR CA	NCEL TO	STOP			TIME INCREMENT	1 second 👻
N/A		*	0 _						DEPTH FORMAT	Normal
Friction Ratio	%	-	2				OK	Cancel	IODULE SERIAL PORT	4 -
SPT-N		•	2 -	● YES	O NO				GPS SERIAL PORT	AUTO DETECT MODULE AND
Soil Behavior Type			-	] ] ⊙YES	O NO				ASCII-OUT SERIAL PORT	ENCODER PORT
Son Denavior Type	ZONE	•	0 -		O NO				ENCODER SERIAL PORT	•
COMP	ANY NAME	VERTEK				QUITS ACTIVATE	D Yes	-	*.DAT FILE	FORMAT Coneplot and ProDAT
TIP PLO	T VALUES	Qc only	-		SOIL	BEHAVIOR CHAR	T R & C - 198	33 💌	FILE	NAMING Manual
PP GRA	PH STYLE	Linear	-		ON-S	SCREEN HEADER	1 Test ID	-	VIDEO RECORDIN	IG MODE None (no frame grabber)
AUTO-ENHANC	E SEISMIC	No	•		ON-S	SCREEN HEADER	2 Operator	•	AUTO-SAVE DISS	
AUTO-FILTE	R SEISMIC	No	•		VIDEO O	VERLAY (DEPTH+	) Depth Only	•	SAVE SCREEN SIZE	ON EXIT No 💌
SHOW	GRIDLINES	Yes	•			SAVE	CANCEL		ADD TRB AND T	MP FILES Yes 💌
		2								

Figure 32 Checking for system notice

CPTSND	
VERTEK MODULE(S) DETECTED ON PORT 4. CLI PORT OR CANCEL TO STOP	ICK OK TO DETECT ENCODER
	OK Cancel

Figure 33 Modules Detected

If using potentiometer click cancel to not look for encoder / click OK if using encoder.

CPTSND	×
ENCODER FOUN	D ON PORT 11
	ОК

Figure 34 Encoder Found - With Potentiometer selected this will say Could not detect Encoder.

**ENCODER SET UP** The optional optical encoder can only be selected in the SYSTEM SETUP/TROUBLESHOOT screen (ref figure 21 & 22). This cannot be changed after detecting the VTK DAS.

Select ENCODER. Choose direction (UP or Down) in ENCODER DIRECTION to ensure that depth increments properly during test (depends on how the unit is mounted). Select the number of millimeters of travel that the encoder makes per step in ENCODER RESOLUTION. This is important so that indicated depth matches actual depth!!! (encoders supplied by VERTEK will use a nominal 5 mm setting that can be fine-tuned out to 3 decimal places to ensure accuracy)

Then select either DEPTH INCREMENT or TIME INCREMENT. Depth Increment must be the same as, or a multiple of, the ENCODER RESOLUTION selected. The Time Increment choice is either continuous or 1 second. In continuous the interval is as close as possible limited by the TIME BETWEEN READINGS rate seen on the testing screen.

The increment setting determines the interval between data capture points during CPT push.

SETUP									
SetQuits Display Settings	Default Dissi	ipation Mode	Ball Tip Area Calcula	ition					
SETUP MODU	JLE: 1 - C	ONE	•		DETEC	CT ON STARTUP		DEPTH UNITS	O meters <ul> <li>feet</li> </ul>
			STATUS: N/A			TAKE	RECORD	DEPTH TRANSDUCER SN	0
CHANNEL NAME	CHANN	IEL UNITS	SIG. DIGITS	DISPLA	Y DATA		CHANNEL		O ENCODER/DIO CLAMP
Тір	PSI	•	3 💌	⊙ YES	O NO		$\checkmark$	DEPTH COUNTER TYPE	ENCODER/DAS CLAMP     O POTENTIOMETER
Sleeve	PSI	•	2 🔻	⊙ YES	O NO	$\forall$	1	ENCODER DIRECTION	Down
Side Temp	C	-	2 🔻	⊙ YES	O NO		1	ENCODER RESOLUTION	5 mm/step
Pore Pressure	PSI	-	2 🔻	⊙ YES	O NO	$\checkmark$	1	POTENTIOMETER OUTPUT	
Excitation Sense	V	•	2 🔻	⊙ YES	O NO		V	SET DEPTH (0 m)	1.45683
Inclination X	Deg	-	1 🔹	⊙ YES	O NO	$\bowtie$	2	SET DEPTH (1 m)	0.48843
Inclination Y	Deg	-	1 🔹	⊙ YES	O NO	$\square$	V	CLAMP CONFIGURATION	O TIME PACED
HFFD	V	•	1 🔹	⊙ YES	O NO		V	SOUNDING RECORDING MODE	O DEPTH BASED
LFFD	V	•	1 💌	⊙ YES	O NO		V	DEPTH INCREMENT TIME INCREMENT	
N/A		-	0 👻	O YES	⊕ NO			DEPTH FORMAT	1 Second
Friction Ratio	%	•	2 👻	O YES	⊙ NO			MODULE SERIAL PORT	
SPT-N		•	2 👻	⊙ YES	O NO			GPS SERIAL PORT ASCII-OUT SERIAL PORT	MODULE AND
Soil Behavior Type	ZONE	•	0 -	O YES	⊙ NO			ENCODER SERIAL PORT	N/A   ENCODER PORT
		VERTEK					Yes		
	ANY NAME				-	UITS ACTIVATED	1100	*.DAT FILE	
		Qc only	<b>_</b>			EHAVIOR CHART	R & C - 1983		NAMING Auto-Increment
	PH STYLE	Linear	•			CREEN HEADER 1	Test ID		NG MODE None (no frame grabber)
AUTO-ENHANC	E SEISMIC	No	-		ON-SO	CREEN HEADER 2	Operator	AUTO-SAVE DISS	
AUTO-FILTER	R SEISMIC	No	•		VIDEO OV	(DEPTH+)	Depth Only	SAVE SCREEN SIZE	ON EXIT Yes 💌
SHOW G	GRIDLINES	Yes	•		3	SAVE	CANCEL	ADD TRB AND T	MP FILES Yes 💌

Figure 35 Set up screen with encoder selected

Then click on AUTO DETECT MODULE AND ENCODER PORT. With an encoder connected a port should be found for MODULE SERIAL PORT and a separate one for ENCODER SERIAL PORT.

1	CPTSND
	AUTO DETECT COMPLETED
	ОК

Figure 36 Auto Detect Completed

If port is not found then verify the port assigned in Device Manager. Manually enter the port from Device Manager in MODULE Serial Port box (fig 32) and try again. If the DAS is still not detected contact the factory for assistance (800-639-6315 or 802-728-4588)

# 4.4 System Settings

Click OK and enter the information in the user selectable entries across the bottom of the set up screen (see Fig 32)

COMPANY NAME: To be displayed on data

TIP PLOT VALUE: to select either Qc & Qt or Qc only

PP GRAPH STYLE: to select either Linear or Logarithmic for dissipations

AUTO ENHANCE SEISMIC: Yes/No

FILTER SEISMIC: Yes/No

GRIDLINES: Yes/No for on screen graphs

QUITS ACTIVE: Yes/No (even with quits set to zero on Set Quits the system will generate a warning for excessive rate of change

SOIL BEHAVIOR CHART: to select from various chart/years

ON SCREEN HEADER 1 / ON SCREEN HEADER 2 to select from the dropdown which items to display on the test. See header on figure 37.

Gridlines	Yes 💌	
Quits Active?	No	
Soil Behavior	R & C - 1983 💌	
On Screen Header 1	Test ID 💌	[
On Screen Header 2	Test ID Operator Crew	
SAVE	Site	
	Client Client Rep	
	Filename	

Figure 37 On Screen Header Drop Down Choices

VIDEO OVERLAY (+DEPTH): same options as Screen Header (for display on video stream if a vision module is used)

.DAT FILE FORMAT: drop down selection to allow file use with different plotting softwares.

FILE NAMING: select manual or auto-increment from the drop down

VIDEO RECORDING MODE: drop down selection for video file types (snapshots or movie capture) and allows for use with a camera module or older vision cone (no module 8)

#### AUTO-SAVE DISSIPATION: yes/no

SAVE SCREEN SIZE ON EXIT: yes/no (this saves the relative screen size on the computer display screen)

ADD TRB AND TMP FILES: yes in this box will have each test generate text data files that take readings every second (TRB) and every second when the depth transducer has activity (TMP)

After all the initial settings are made, press save. This returns to the main screen.

# 4.5 Detecting connected items

press 'DETECT VTK DAS'. The system will then look for ports & modules connected.

CPTSND (ARA, 2013)		
	CHECKING FOR VERTEK MODULE(S) ON PORT 0	
	Softwa	_
A Division of AR		58
	VERTEK MODULE(S) NOT FOUND ON SPECIFIED PORT. PLEASE CHECK CONNECTIONS, POWER AND SYSTEM SETUP. WOULD YOU LIKE TO SEARCH FOR THE PORT?	<b>WS</b> .0.30
	Yes No	ates, Inc.
	250 Beanville Road Randolph, VT 05060 US	SA
SYSTEM SETUP/ TROUBLESHOOT	Tel: (802) 728-4588 FAX: (802) 728-9871 www.vertekcpt.com	
EXIT	RESUME	DETECT VTK DAS

Figure 38 Looking for Modules

If the modules are not found on specified port click on yes and the system will find the correct port. Ports settings can change due to WINDOWS USB configuration issues.



Figure 39 Modules Detected

Once the port has been found click on OK to proceed with polling for connected modules. Once the system has checked all options it will then display a screen showing what it found. Note that you can check the cal factors from this screen to see the recorded data in the modules.

DETECTED MODULES	
MODULE 3: DATAPACK Serial Number: 18266-1.10 Sensor 3: Aux1 found Sensor 3: Rod Depth found Sensor 3: A Clamp found SHOW CAL FACTORS MODULE 5: SEISMIC CONE Serial Number: 444, 144XX Sensor 5: Tip found	
Sensor 5: Sleave found Sensor 5: Temperature found Sensor 5: Pore Pressure found Sensor 5: Exc Sense found Sensor 5: Inclination X found Sensor 5: Inclination Y found SHOW CAL FACTORS	
	ОК

Figure 40 Modules Found Screen

	SENSOR 0	SENSOR 1	SENSOR 2	SENSOR 3	SENSOR 4	SENSOR 5	SENSOR 6
CHANNEL #	0	1	N/A	2	6	3	4
SENSOR LABEL	Tip	Sleeve	Temperature	Pore Pressure	Exc Sense	Inclination X	Inclination Y
CAL FACTOR 0	8.038680E-002	2.568190E-001	N/A	4.658940E+000	1.022000E+000	1.032400E+001	1.041400E+00
CAL FACTOR 1	1.000000E+000	1.000000E+000	N/A	1.000000E+000	1.000000E+000	1.000000E+000	1.000000E+00
CAL FACTOR 2	1.000000E+000	1.000000E+000	N/A	1.000000E+000	5.115000E+000	1.000000E+000	1.00000E+00
CAL FACTOR 3	0.000000E+000	0.000000E+000	N/A	0.000000E+000	0.000000E+000	0.000000E+000	0.000000E+00
CAL FACTOR 4	0.000000E+000	0.000000E+000	N/A	0.000000E+000	0.000000E+000	0.000000E+000	0.000000E+00
UNIT FACTOR 0	1.510000E+000	6.490400E+000	N/A	1.000000E+000	0.000000E+000	2.013000E+003	0.000000E+00
UNIT FACTOR 1	1.790000E+000	1.730000E+000	N/A	1.000000E+000	0.000000E+000	1.000000E+000	0.000000E+000
UNIT FACTOR 2	2.350000E+000	3.542000E+001	N/A	1.000000E+000	0.000000E+000	2.300000E+001	0.000000E+000
UNIT FACTOR 3	0.000000E+000	0.000000E+000	N/A	0.000000E+000	0.000000E+000	0.000000E+000	0.000000E+000
UNIT FACTOR 4	0.000000E+000	0.000000E+000	N/A	0.000000E+000	0.000000E+000	0.000000E+000	0.000000E+000

And this is what the SHOW CAL FACTORS tab will display

Press OK, after a short pause the sounding screen will be displayed. See figure 37 on next page.

#### SECTION V Preparing for, and Performing, a SOUNDING

5.1 About the test screens. This begins the TEST SETUP section. Following is a description of the screen items.

🛞 VERTEK CP	PT, 2016											— D	$\times$
Test Setup	System Setup	Module Setting	s Module P	lacement Mon	itor Classi	fication	Communication	n Delay	Ram Settings	Verification	Exit		
SOUNDIN	1G				TESTID		ATOR: N/A						
	Tip	•	-1.27PSI	eeve	-		Pore Pressure	•	0.09PSI	Soil Behavior	Type V	<out of="" range<="" td=""><td>&gt;</td></out>	>
	FORCE:	0 lbf		FORCE:	0 lbf	0 N				Joon Donation	.,,,,	3	
	0	PSI	0 0		PSI	0	0	PSI		0 0	ZONE		12
0													
Depth													
(m)													
0	0	PSI			PSI	0	0	DOL		0 0	ZONE		12
	ETWEEN READING		COMM STATUS					PSI		1			12
CURREN	NT SOIL BEHAVIO			TAKE BASEL	INE		START		STOP		NUMBER OF	F GRAPHS 4	-
		Tip	-1.27PSI	Pore Pressure	0.09PS	Inclinat		0.04Deq	Soil Behavior	0ZONE			
		Sleeve Temperature	0.00PSI 155.45C	Exc Sense Inclination X	0.98V -0.02Deg	Friction	Ratio	0.00%					
	5 10 15	DEPTH		SPEED								CAMERA	
			0 00					DEPTH ()	MANUAL CLAMP	PERF	ORM SEISMIC		ON
TOTAL INCL:	00.0 daa		0.00						AUTO CLAMP: INA	ACTIVE STAR	T DISSIPATION	LAMP ON UV ON IR ON	
TOTAL INCL:	oo.o deg												

Figure 41 Sounding Screen (shown in outdoor display mode)

Up to 4 graphs can be selected to display during the test (there is a drop down box on the right side of the screen to change the number of graphs)

The inclinometer 'bubble' is displayed in the lower left corner. It is green up to 7 degrees, then turns yellow for warning through 12 degrees and then will turn red. This visual change is for operator awareness. See Module Settings instructions for using inclination to generate a stop condition.

Across the bottom is one window for recorded depth and one for push speed. The push speed box will be green when pushed at ASTM rate of 2cm/sec and yellow when close to that.

The clamp light will show green when clamp is detected engaged or when the MANUAL CLAMP button is used. The MANUAL CLAMP button allows for system use with virtually no interface with the push

system and allows the operator to control when data is collected. The AUTO CLAMP button will engage data collection whenever the conditions for the clamp circuit are met and valid depth is being collected.

Perform Seismic / Start Dissipation / and CAMERA selections will be covered later in this manual

Just above the Depth and Speed boxes is a series of white boxes across the screen that display all the readings that are checked in the detected module set up screen so they can be monitored even if they are not being graphed.

Just above this (and below the actual graph sections) are the buttons for TAKE BASELINE -- START -- STOP. Notice that they are grayed out unless that action can be performed.

We have also included a TIME BETWEEN READINGS which updates continuously based on cone communications. This is on screen indication that the cone is functioning and in communication with the DataPack. The time displayed will vary depending on how many channels are being used and amount of data. The green indicator beside the time box is a visual indication of COMM STATUS.

Each Graph section can be assigned to any of the channels available in the drop down menu. Choice based on module or cone attached and detected.

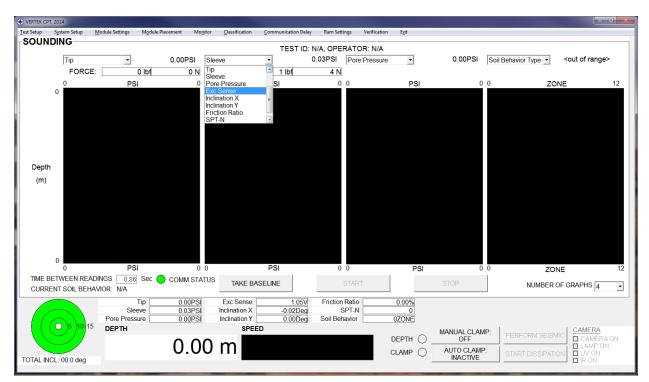


Figure 42 Test screen with a drop down open (shown in indoor display mode)

Now is the time to verify and set up the system as detected. At the top of the screen go to SYSTEM SETUP and click on it. The upper left section should be verified for each module connected. The upper right section and lower section are for the test in general (not affected by module settings)

SETUP	_	_	_		_	_		_	_	_	_
SETUP MODUL			E	D	ETECT ON S	TARTUP No	•		DEPTH UNITS	• meters	C feet
	3 · DA	P/RES TAPACK		N/A		<u>TAKE</u> a BASELINE	RECORD	DEPTH	I TRANSDUCER SN	N/A	
<u>CHANNEL NAME</u> N/A	5 - SEI 6 - FFD			GITS	C YES C NO	<u> </u>		DEPT	TH COUNTER TYPE	○ ENCO ◎ POTE	DER NTIOMETER
N/A	8 - CAM	UNTER MERA		-	C YES @ NO				CODER DIRECTION	Up	•
N/A		- Instatevi			O YES @ NO			ENCO	DER RESOLUTION	5	mm/step
N/A		-		 	C YES @ NO	_		POTENT	IOMETER OUTPUT		
N/A				_			_		SET DEPTH (0 m)	0.1	7716
		<b>–</b>	0	-	C YES @ NO				SET DEPTH (1 m)	3.1	38 <mark>20</mark>
N/A		Ψ.	0	Ψ.	C YES @ NO			CLAM	P CONFIGURATION	Normally O	pen 💌
N/A		Ŧ	0	-	C YES @ NO			SOUNDING	RECORDING MODE	⊙ TIME ○ DEPT	BASED H BASED
N/A		-	0	-	C YES @ NO			C	EPTH INCREMENT	20	mm
N/A		-	0	-	C YES @ NO				TIME INCREMENT	Continuous	•
N/A		-	0	-	O YES @ NO				DEPTH FORMAT	Normal	•
N/A	,	-	0		C YES @ NO	- -	_	MOD	ULE SERIAL PORT	21 💌	1
N/A				_	C YES € NO				GPS SERIAL PORT	•	AUTO DETECT MODULE AND ENCODER PORT
		<u>~</u>	0	~					DUT SERIAL PORT		AND ENCODER FORT
N/A		~	0	<b>T</b>	C YES @ NO	]		ENCU	DER SERIAL PURT	11 💌	
COMPAN	NY NAME	ARA				QUITS ACTIVATE	D Yes	•	*.DAT FILE	FORMAT	Coneplot and ProDAT
TIP PLOT				•		BEHAVIOR CHAP					Auto-Increment
PP GRAP				-		SCREEN HEADER		-	VIDEO RECORDI		
AUTO-ENHANCE AUTO-FILTER				-		SCREEN HEADER DVERLAY (+DEPT		<u> </u>	AUTO-SAVE DIS SAVE SCREEN SIZE		
SHOW GR				-	41020 L		• ,		SATE SURER SIZE		
		1				SAVE	CANCEL				

Figure 43 Setup screen with module drop down open/ string pot selected

#### 5.2 Setting the Depth Potentiometer (String Pot)

Now we verify the settings that we discussed earlier and set up the string potentiometer if that is the depth device selection.

Stage the string of the potentiometer as if you were ready to start a rod push. This is the zero (0m) meter position. Press the SET DEPTH (0m) button. This will record the voltage at the starting point of the push. Then advance the string *exactly* one meter (as if you pushed a rod) and push the SET DEPTH (1m) button. This will record the voltage at that point. The system now has recorded the voltage change for one meter of movement and will accurately provide depth and speed data with calculations based on this set up. (Our standard 80" string pot will provide approximately one volt differential in the one meter stroke)

NOTE: The distance the string is moved during this set up needs to be <u>exactly one meter</u> whether you are displaying feet or meters.

NOTE: Some users mount the string pot high and pull the string for a rod insertion, while others mount the string pot low so that the string is retracting on insertion. So some will have the higher reading on the (0m) line and others will have the higher reading on the (1m) line. Either is okay - depth is only increased while the string is moving in the appropriate direction.

The optional optical encoder can only be selected in the SYSTEM SETUP/TROUBLESHOOT screen (ref figure 21 & 22). This cannot be changed after detecting the VTK DAS.

## 5.3 Setting up the test screens

Verify the settings for each module that is used (figure 39) You can change units of measure, decimal places to display and whether or not to display any of the items that are not grayed out.

Now is also the time to verify the two screen headers desired and whether or not you want to auto enhance and/or filter the seismic waves if you are doing seismic tests.

Save these settings and then click on the Module Settings button:

SET MODULE DELAYS												
SEISMIC CONE : 4444.138XX												
МЕ	CHANNEL OFFSET: CHANNEL CAPACITY: ENTER MEASURED FROM START OF ZERO IF NOT APPLICABLE MODULE											
Тір	3.8354 centimeters	0	PSI									
Sleeve	16.4846 centimeters	0	PSI									
Side Temp	0 centimeters	0	С									
Pore Pressure	0 centimeters	0	PSI									
Excitation Sense	0 centimeters	0	V									
Inclination X	2.54 centimeters	0	Deg									
Inclination Y	0 centimeters	0	Deg									
N/A	N/A centimeters	0	V									
N/A	N/A centimeters	0	V									
N/A	N/A centimeters	0										
o	VERALL MODULE LENGTH	43 centimeters										
SEISMIC MODULE DETEC	CTED. INTERVAL SEISMIC?	• NO O YES										
INTER	VAL SEISMIC SEPARATION	0 centimeters										
	ОК											

Figure 44 Set Module Delays

A length is required in OVERALL MODULE LENGTH so the system can keep track of the offsets if another module is added to the CONE. Exact length of the cone is not critical unless another module is to be added The data entries for the tip offset, pore pressure, sleeve offset and inclinometers are grayed out as this information is stored in the cone.

NOTE: True Interval Seismic cones are very rare. Select no for this setting unless you confirm with the factory. (A true interval seismic cone has either one meter or one half meter separation between geophones making the cone considerably longer than standard)

#### **Channel Capacity Settings**

On the right hand side of the Module Settings screen (Fig 40) you can enter capacities to trigger a system quit alarm. If you leave them at zero then the system will not go into quit state unless the rate of change is excessive. See fig 41 for a sample alarm based on inclination exceeding the 12 degree setting in module settings.

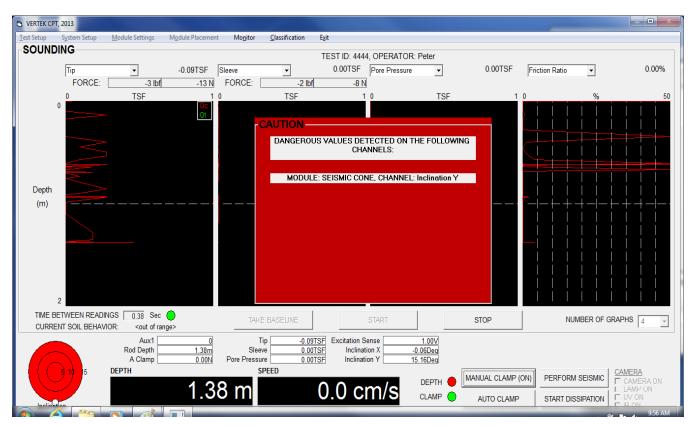


Figure 45 Overload sample screen

Click okay to return to the testing screen. Now click on TEST SETUP :

	TE	ESTINFOR	RMATION			
TESTID			CLIENT			
OPERATOR / CREW	23 34					-
PROJECT	45		WEATHER	RAIN	:	-
SITE			SOFTWARE VERSION	2.7.0		
LOCATION	67	DAS SYSTEM		DP2646.115		-
START DEPTH (ft)	0		PROBE SERIAL #	2579.108US		-
	Fri 12/Oct/2018		SAMPLE RATE	N/A		-
	5:18:02		DEPTH INCREMENT (m)	20m		-
COMMENTS			TIP CONFIGURATION	Conical (default)		<b>-</b>
GPS (LAT, LON, ELEV, NSAT, QUAL)			BALL TIP DIAMETER		millimeters	_
WATER TABLE DEPTH (m)	0		NET AREA RATIO (FOR Qt)	.8		
PREV GPS: 0, 0, 0, 0, 0	ACQUIRE GPS (AUTO)	1	DISSIPATION MODE			-
RIVE	ENTER GPS (MANUAL)	ĺ	EXISTING DAT FILES	1		
		•	234(001).DAT			
			234(001)_PD.DAT			
RECTORY C:\			234(002).DAT 234(002)_PD.DAT			
cpt test			234(003).DAT			
cpt1tst			234(003)_PD.DAT 234(004).DAT			
			234(004)_PD.DAT			
			234(005).DAT 234(005)_PD.DAT			
			234(007).DAT			
			234(007)_PD.DAT			
			234(008).DAT 234(008)_PD.DAT			
CREATE NEW I	DIRECTORY	FILENAN	IE FFD(042)			
\cpt test\FFD(042)						
	0	к	CANCEL			

Figure 42 Setup Test Screen

This is where you enter pertinent information to be saved as header information in the cone data file. Notice that there are several grayed out sections that are auto filled by the system. The data in the upper half is self-explanatory for the most part. Start depth (elevation) would only be entered if DEPTH FORMAT Elevation was selected in setup. (using elevation mode and not entering a start depth will result in negative depths on test results) GPS data can be input automatically with an external GPS unit connected to your computer or manually using standard convention format.

On this screen as well you can select which drive and folder you want to store the test results in. At the bottom is a button for CREATE NEW DIRECTORY to enable better organization of data. NOTE: Many computer operating systems do not allow users to write data files directly to the root directory.

NOTE: the filename will be the name the test is stored under in your computer, the test ID is only for your reference. On some computers file names with spaces or special characters can cause issues. Please use standard naming practices.

Click okay to return to the test screen.

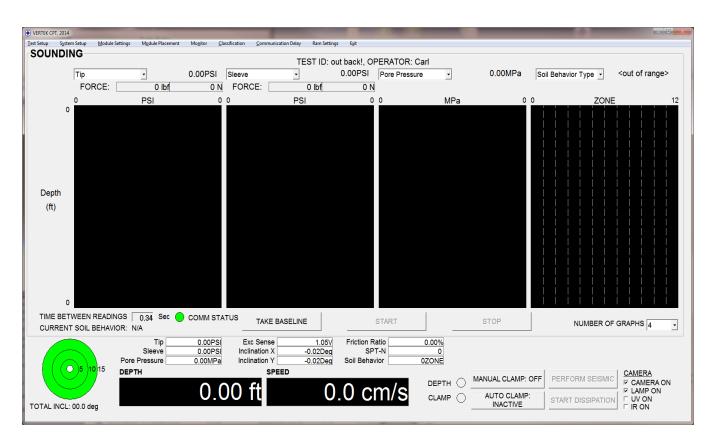


Figure 43 Sounding Screen

## 5.4 SOUNDING

Now the test screen is populated with the settings chosen and headers entered and identified in previous steps.

Ensure that the cone is in position (vertical) and ready to push but not in contact with the ground. This is when a baseline is taken. (Prior to taking the baseline it is important for the cone to be at or near the anticipated ground temperature. Either sitting in the hot sun or being stored in a freezing cold truck overnight can lead to significant baseline shifts as the cone comes to ground temperatures—take steps to keep the cone at an even temperature to ensure best results)

Take the baseline by clicking the TAKE BASELINE button, then stage the cone on the ground and press START. Data will now be displayed and recorded when the depth is moving and the 'clamp' is green.

If the system being used to push the cone has a clamp switch or other means of indicating status of the push then the AUTO CLAMP button would be used to allow the data collection to occur as the rods are pushed. If there is no interface then the TOGGLE CLAMP button is used to tell the system when to accept data (both depth and cone data) The CLAMP indicator is green when data can be collected and is blank when data is not collected (while adding rods)

NOTE: Seismic tests should be conducted with the clamp disengaged from the rods to reduce the possibility of data distortion via pressure on the rods.

During the push the DEPTH indicator will be green when going in the proper direction (into the ground) red when going up and blank when not in motion. (With the potentiometer used this display will be steady; with the encoder in use the indicators will 'flash' using the same color pattern)

Continue the test in this manner until the desired depth is reached or refusal is reached. Refusal can be for excessive forces recorded by the probes or for reaching the limits of the push system due to total resistance exceeding reaction weight or hydraulic push capacity.

It is recommended to record an ending baseline reading at the end of the push. To do this, do not end the test until the rods and cone are fully out of the ground and in the same position as the pre push baseline. Ensure the sleeve is not packed with dirt to inhibit freedom of movement and take the baseline.

Then end and save. You can choose to start another test or completely close.

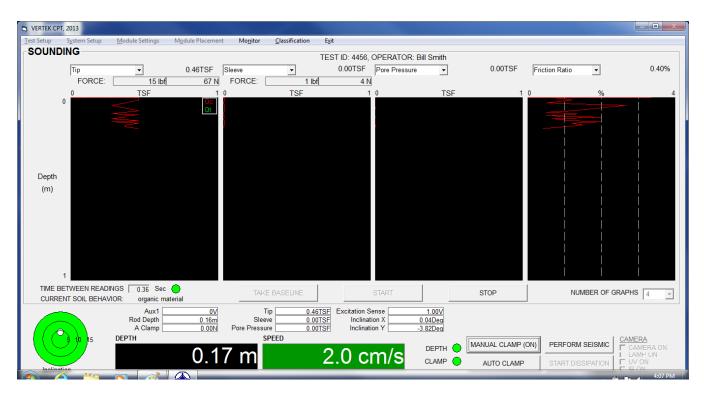


Figure 44 Sounding screen with push in progress

VERTEK CPT, 2013									_ 0 X
Test Setup System Setup	Module Settings	Module Placement	Mo <u>n</u> itor <u>C</u> la	ssification E <u>x</u>	t				
SOUNDING		_							
		-			ST ID: 4456, OPERATO				
Tip	<b>_</b>	1	Sleeve	<u> </u>	0.01TSF Pore Press	sure 👻	0.00TSF	Friction Ratio	2.00%
FORCE:		53 N	FORCE:	4 lbf	16 N				
0	TSF	2 (	)	TSF	1 0	TSF	1	0 %	4
Depth (m)		<u>o</u> r							
TIME BETWEEN READ CURRENT SOIL BEHA			TAKE BAS	SELINE	START		STOP	NUMBER OF GF	APHS 4
	Aux1 Rod Depth A Clamp DEPTH	0V 1.15m 0.00N <b>1.1</b>	Tip Sleeve Pore Pressure SPEED		Inclination X	1.00V 2.26Deg -2.95Deg DEPTH CLAMP ()	MANUAL CLAMP (C	PERFORM SEISMIC	

Figure 49 Sounding in progress at a pause (not clamped)

## SECTION VI SEISMIC TEST

If the system has been set up to perform seismic tests and a seismic cone is attached, then seismic tests can be performed during the sounding. This section describes the seismic test.

This section assumes that CPT sounding is in progress and advanced to the desired depth for a seismic test.

This section also assumes that a suitable strike plate (or automated device) is properly situated near the CPT push system (normally 5 to 10 feet from the CPT entry point into the ground), and that the trigger to register the strike is properly mounted and functioning.

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 of the push system 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 be cut. NOTE: If a Vertek 20-ton truck is used, the one piece front leveling jack as strike plates. This may damage the jacks.

The following screen is displayed when the PERFORM SEISMIC button is clicked on the main test screen:

VERTEK CPT, 2014		
Test Setup System Setup Module Settings Mod	dule Placement Mo <u>n</u> itor <u>C</u> lassification <u>C</u> ommunication Delay Ram Settings Verification E <u>s</u> it	
SEISMIC (INTERVAL SEISMIC:	TEST ID: 12345, OPERATOR: 23	STRIKE OPTIONS
1 <u>SGE01</u> SGE02 PGE0  9GE0  9 0	N/A N/A 2.07 Current Arrival Time (mS) N/A N/A	INTERVAL (mS)         IS00 MS (MODE 1)         SELECT GEOPHONE         ~ SGEO1 ONLY         ~ SGEO1 NLY         ~ SGEO1 SGEO2         ~ PGEO         ~ ALL GEO         SEISMIC GAIN         50       (SGEO1+2)         50       (PGEO)         ~ AUTO ENHANCE         ~ FILTER         SET DEFAULT STRIKE         OPTIONS
-1 0 SHOW PREVATEST F SHOW PREV B TEST PERFORM A(SGE01) + B(SGE02) STRIKE	If Show PREV PIEST     TIME (ms)     OFFSET A AND B TESTS (DISPLAY ONLY)     50       RETAIN STRIKE     DISCARD STRIKE     RETURN TO RETURN     SAVE TEST / RETURN TO SOUNDING	
Tip Sleeve Pore Pressure DEPTH TOTAL INCL: 00.9 deg	0.00PSI       Exc Sense       1.01V       Friction Ratio       0.00%         -1.77PSI       Inclination X       -0.81Deg       SPT-N       0         0.68PSI       Inclination Y       0.29Deg       Soil Behavior       0ZONE         SPEED         DEPTH O       MANUAL CLAMP: INACTIVE         DEPTH O         DEPTH O         DEPTH O	M SEISMIC CAMERA C CAMERA ON C CAMERA ON C LAMP ON ISSIPATION F IR ON

Figure 46 Seismic test screen

The main screen information is still displayed in the lower portion of this screen. The options for a seismic test are selected on the right side.

- INTERVAL (ms) is the length of time the system will wait for the arrival time after the trigger signal is received. This is selected via the drop down menu (100 ms to 1 minute)
  - 100ms to 1 second tests are 'Mode 1' tests and can be used to plot standard waterfall graphs and to generate a velocity profile. Tests between 10 sec and 1 minute are 'Mode 2' tests and do not have arrival time processing functions available. This is only used to record the seismic activity present in the ground (created by other equipment) This can be useful in site work not related to CPT. (all geophones can be recorded at the same time in this mode)
- Click on the geophone to be monitored (SGEO1 only, SGEO2 only, SGEO1 & SGEO2, or PGEO). This selection determines which geophone in the cone is to be monitored. The DataPack Seismic switch or remote trigger switch is used to select the proper up-hole trigger. (some seismic tests are done using 3 trigger locations the selector switch is only to select the proper trigger.
- SEISMIC GAIN is the amount of gain on the signal to be applied for graphing purposes. Selected via the drop down menu (1 to 5000 available)
- AUTO ENHANCE this will automatically enlarge (enhance) the signal to provide a more visible arrival wave
- FILTER this box checked will provide a cleaner visual arrival wave for easier evaluation.



Figure 51 Trigger remote switch/ DataPack switch / connector hub with trigger and switch

Click on the PERFORM STRIKE box. The selection on the right side will determine which geophone is recorded. For this sample SGEO1 & SGEO2 is selected. The Waiting For Seismic Trigger box will appear. ( if an error appears at this point –UNABLE TO INITIALIZE 1608FS- refer to troubleshooting for steps to initialize)

VERTEK CPT, 2014									
		e Placement Monitor	<u>Classification</u>	ommunication Delay R	am Settings Verification	Egit			
SEISMIC (INTERVAL		OFF)	TEST	ID: 12345, OPER	ATOR: 23				STRIKE OPTIONS
1 SGE0 SGE0	1 <u></u>							N/A	500 mS (MODE 1) -
SGEO	ō							N/A 2.07	SELECT GEOPHONE
							Current Arrival Time	e (mS) N/A	C SGEO1 ONLY
								N/A	C SGE02 ONLY
									€ SGE01+SGE02
									C PGEO
									C ALL GEO
									SEISMIC GAIN
o				Waiting For S Trigge					50 (PGEO)
				Cancel					AUTO ENHANCE     FILTER
									SET DEFAULT STRIKE
									OPTIONS
									FIND ARRIVAL TIME
									MOVE ARRIVAL TIME
									LEFT
-1									MOVE ARRIVAL TIME RIGHT
0 IF SHOW PREVA IF SHOW PREVE		SHOW PREV	PTEST	TIME (	mS)	AND B TESTS (DIS	PLAY ONLY)	500mS	SCALE / SHIFT GRAPH
PERFORM. B(SGEO2	A(SGE01) + 2) STRIKE		RETAIN STRIKE	DISCARD STRIKE	REMOVE STRIKE		SAVE TEST / RETURN	RETURN TO SOUNDING	FILTER / ENHANCE
	Tip	0.00PSI	Exc Sense	1.01V	Friction Ratio	0.00%			
	Sleeve Pore Pressure	-0.78PSI 0.73PSI	Inclination X	-0.93Deg 0.64Deg	SPT-N Soil Behavior	0 0ZONE			
	DEPTH	0.751-51	SPEEI		Con Bonavior	020NL	MANUAL CLAM	D:	( CAMERA
		0.0					INACTIVE	P: PERFORM SEI	SMIC CAMERA ON
		6.8	O ft	0.0	) cm/s	CLAMP	AUTO CLAMP: AC	TIVE START DISSIP	
TOTAL INCL: 01.3 deg							AUTO CLAMF. AU		

Figure 52 Waiting for Trigger

Once the trigger signal is received the system will display the cone geophone response on the screen. It also displays the 'Select Seismic Wave' box shown in Fig 49 to choose the geophone that is better aligned to the strike to improve test accuracy. Note that in this example the interval was at 500 ms so the arrival

time was approximately 125 ms after trigger and that SGEO1 has the better response so it would be recommended to use SGEO1 and set as default for this test. If the arrival wave was not definite it is recommended at this time to orient the cone and try again until a good arrival wave is obtained.

€ VERTEK CPT, 2014	— • ×
Test Setup System Setup Module Settings Module Placement Monitor Classification Communication Delay Ram Settings Verification Exit	
SEISMIC (INTERVAL SEISMIC: OFF) TEST ID: 12345, OPERATOR: 23	STRIKE OPTIONS
1 SGE01	SGEOCONLY © SGEOCONLY © SGEOCONLY © SGEOCONLY © SGEOCONLY © SGEOCONLY © SGEOCONLY © SGEOCONLY © SGEOCONLY
0	C ALL GEO SEISMIC GAIN 50 (SGEO1+2) 50 (PGEO) F AUTO ENHANCE F FILTER
1	SET DEFAULT STRIKE OPTIONS FIND ARRIVAL TIME MOVE ARRIVAL TIME LEFT MOVE ARRIVAL TIME RIGHT
0 F SHOW PREV A TEST F SHOW PREV P TEST TIME (mS)	SCALE / SHIFT GRAPH
PERFORM A(SGEO1) * RETAIN A+B DISCARD A+B STRIKE SAVE TEST / RETURN TO SOUNDING	FILTER / ENHANCE
Tip         -4.40PSI -0.03PSI Sleave         Pore Pressure -0.03PSI -0.03PSI Inclination X         -0.09PSI -0.09FSI -0.03PSI Priction Ratio 0.000%I SPTN         Soil Behavior         0.020NE           5         10         Temperature DEPTH         22.34C         First on X -0.02DEg         First on X -0.02DEg         Soil Behavior         0.020NE           DEPTH         SPED         DEPTH         MANUAL CLAMP: INACTIVE         PERFORM	L CAWERA ON
total INCL: 00.0 deg	SIPATION

Figure 53 Initial strike

Now an A strike is performed, and then a B strike if desired. It is common to get an A & B (or left and right if you prefer that nomenclature) at each depth. Figure 50 shows the results of an A and a B strike after the SEO1 selection above.

🛞 VERTEK CPT, 2014	2000 BR 1				100	_		
	ule Settings Module Placement	Monitor Classification Con	munication Delay Ram	Settings Verification	Egit			
SEISMIC (INTERVA	,	TESTIC	): 12345, OPERA	TOR: 23				STRIKE OPTIONS
1 SGE SGE( PGE						Current Arrival Time (r	N/A N/A 2.07 N/A N/A N/A	500 mS (MODE 1)  SELECT GEOPHONE G SGE01 ONLY G SGE02 ONLY G SGE01+SGE02 G PGE0
•								C ALL GEO SEISMIC GAIN 50
-1		Ý						FIND ARRIVAL TIME MOVE ARRIVAL TIME LEFT MOVE ARRIVAL TIME RIGHT
0 IF SHOW PREV. IF SHOW PREV		V PREV P TEST	TIME (m	S)	ID B TESTS (DR	SPLAY UNLY)	500mS	SCALE / SHIFT GRAPH
PERFORM A STRIKE	PERFORM B STRIKE	RETAIN STRIKE	DISCARD STRIKE	REMOVE STRIKE		SAVE TEST / RETURN	RETURN TO SOUNDING	FILTER / ENHANCE
	Sleeve	7.33PSI         Pore Pressure           0.06PSI         Exc Sense           22.88C         Inclination X	-0.09PSI 0.98V -0.02Deg	Inclination Y Friction Ratio SPT-N	-0.09Deg 0.00% 0	Soil Behavior	0ZONE	
TOTAL INCL: 00.1 deg	DEPTH	6.80 ft			DEPTH () CLAMP ()	MANUAL CLAMP: INACTIVE AUTO CLAMP: ACTIV	E START DISSIP	E LAMP ON

Figure 54 with A & B strike

Then click SAVE TEST and return to sounding. A warning screen will appear if the seismic data is not saved before returning to sounding. At the next depth increment for seismic test the previous test will be shown.

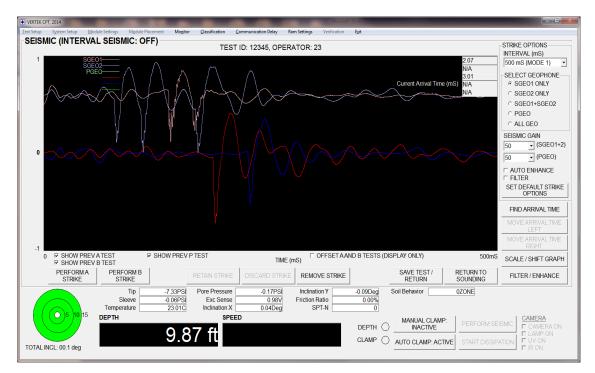


Figure 55 Seismic test with two depths of A & B strikes

Please note that the samples shown on these pages are from a bench test and the appearance of the waves may vary.

Arrival times can be set before saving the seismic data and the option to do so is provided in the software. Experience has proven that; SETTING ARRIVAL TIMES at this time can lead to erroneous plotting. Many users find it better to gather all the seismic data for one sounding and choose arrival times during processing when the strikes from all depths can be viewed on one screen.

#### SECTION VII DISSIPATION TEST

To run a dissipation test, stop the push motion, unclamp, and click on the START DISSIPATION box.

The dissipation screen will appear (fig 60) and the green line will increment across the page in one second increments, while recording the pore pressure. When the pressure has equalized or reached a predetermined level, click on SAVE DISSIPATION if the data is valid, or RETURN TO SOUNDING. Returning to sounding without saving the data will bring up an error (see fig 61) Select the proper option to proceed as desired.

In the Dissipation Interval Mode, the recorded intervals change during longer tests as follows: 1 second for the first minute, 5 seconds for the next 9 minutes, 30 seconds for the next 50 minutes, and 5 minutes thereafter.

In the Dissipation Continuous Mode, data is recorded at each communication cycle of the data pack to cone/ normally 2 or 3 times per second. This is not recommended for long dissipation tests due to the file size that can be created.

In between the above options is One Second Interval selection which records as indicated; once per second.

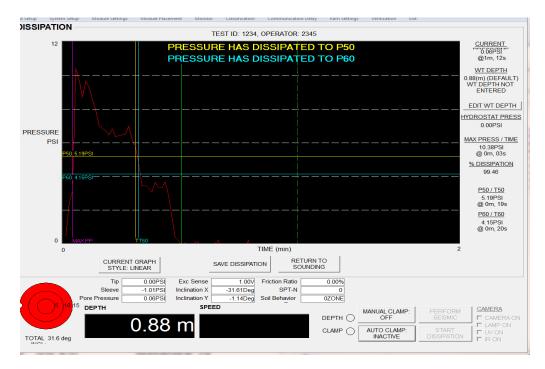


Figure 60 Dissipation Screen with a Short Dissipation test

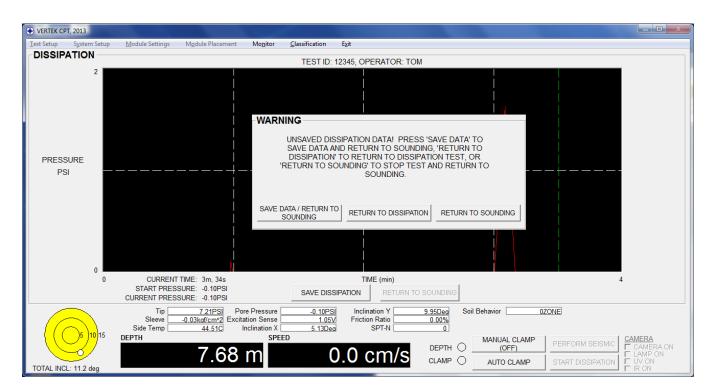


Figure 61 Dissipation unsaved warning

NOTE: It is recommended to not run another dissipation test until the cone has been advanced a few inches.

### VIII VERIFICATION

Regular VERIFICATION of equipment is required by some agencies and or customers. To allow this Vertek has a simple verification process built into the VTK series software.

To run a verification test on the cones requires a load cell and pressure chamber that can be plugged into the DataPack AUX connector. Select the Verification tab at the top of the sounding screen and then select sensor setup at the top of the PROBE VERIFICATION screen. This is prompted the first time it is opened. Enter the data from the device tags or calibration sheets and save the data.

PROBE VERIFICATION			
Save Sensor Setup Cano	el		
SLEEVE TRANSDUCER	STATUS: IDLE		
APPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
Í	REFERENCE SENSOR SETUP		
START SLEEVE VERI	REFERENCE LOAD CELL (for Tip and Sleeve Vo	erification)	
RESET SLEEVE VERI	MANUFACTURER		
	SERIAL NUMBER		
APPLIED PRESSURE (PSI)	CAPACITY (lbf) 0	(e.g. 10000)	red Dev %
	SENSITIVITY (mV/V)	(e.g. 4.368)	
START TIP VERIFIC STOP TIP VERIFIC RESET TIP VERIFIC PRESSURE TRANSDUCER APPLIED PRESSURE (PSI)	REFERENCE PRESSURE TRANSDUCER (for PP         MANUFACTURER         SERIAL NUMBER         CAPACITY (PSI)         SENSITIVITY (mV/V)         SAVE	<b>∨erificatic</b> (e.g. 500) (e.g.100)	n)
START PRESSURE VER	IFICATION		
STOP PRESSURE VER	FICATION		
RESET PRESSURE VER	FICATION RECORD PP READING		

Figure 62

REFERENCE SENSOR SETUP		
REFERENCE LOAD CELL (fo	r Tip and Sleeve V	erification)
MANUFACTURER	SENSOTEC	
SERIAL NUMBER	abc	
CAPACITY (Ibf)	10000	(e.g. 10000)
SENSITIVITY (mV/V)	4.368	(e.g. 4.368)
REFERENCE PRESSURE TRA	NSDUCER (for PP	Verification)
MANUFACTURER	Honeywell	
SERIAL NUMBER	def	
CAPACITY (PSI)	500	(e.g. 500)
SENSITIVITY (mV/V)	100	(e.g.100)
SAVE	CANCEL	

Figure 63

ve Sensor Setup Cancel			
	STATUS: VERIFYING SLI	EEVE	
SLEEVE TRANSDUCER	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
		<u>- 1991/04</u>	
0.00	0.00		
	•		
START SLEEVE VERIFICATION			
STOP SLEEVE VERIFICATION			
RESET SLEEVE VERIFICATION	RECORD SLEEVE READING		
IP TRANSDUCER APPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
		Applied	Medsured Devis
N/A	0.00		
START TIP VERIFICATION			
STOP TIP VERIFICATION			
	RECORD TIP READING		
RESET TIP VERIFICATION			
RESSURE TRANSDUCER			
J PRESSURE TRANSDUCER APPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
J PRESSURE TRANSDUCER APPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
PRESSURE TRANSDUCER	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
J PRESSURE TRANSDUCER APPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
J PRESSURE TRANSDUCER APPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	
APPLED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %

Figure 64

. Canada Catura Canad			
e Sensor Setup Cancel			
LEEVE TRANSDUCER	STATUS: VERIFYING TIP		
PPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	Applied	Measured Dev %
N/.	A 0.00	1.07 4.53	0.89 -17.55
	A 0.00	11.01	4.35 -4.13 10.82 -1.80
		17.49 28.56	17.28 -1.19 28.34 -0.76
START SLEEVE VERIFICATION	1	20.00	20.34 -0.76
STOP SLEEVE VERIFICATION	1		
RESET SLEEVE VERIFICATION	RECORD SLEEVE READING		
P TRANSDUCER			
	MEASURED PRESSURE (PSI)	<u>Applied</u> 47.73	49.19 3.06
2.1	0 3.88	137.66	141.09 2.49
2.7	6 3.88	137.66 161.30 177.49	141.09 2.49 165.68 2.71 181.22 2.10
2.1	0 3.88	161.30	165.68 2.71
START TIP VERIFICATION	0 3.88	161.30 177.49	165.68 2.71 181.22 2.10
		161.30 177.49	165.68 2.71 181.22 2.10
START TIP VERIFICATION	0 3.88	161.30 177.49	165.68 2.71 181.22 2.10
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION		161.30 177.49	165.68 2.71 181.22 2.10
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION RESSURE TRANSDUCER PPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	161.30 177.49	165.68 2.71 181.22 2.10
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION RESSURE TRANSDUCER PPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	161.30 177.49 204.99	165.68         2.71           181.22         2.10           209.69         2.29
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION RESSURE TRANSDUCER	MEASURED PRESSURE (PSI)	161.30 177.49 204.99	165.68         2.71           181.22         2.10           209.69         2.29
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION RESSURE TRANSDUCER PPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	161.30 177.49 204.99	165.68         2.71           181.22         2.10           209.69         2.29
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION RESSURE TRANSDUCER PPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	161.30 177.49 204.99	165.68         2.71           181.22         2.10           209.69         2.29
START TIP VERIFICATION STOP TIP VERIFICATION RESET TIP VERIFICATION RESSURE TRANSDUCER PPLIED PRESSURE (PSI)	MEASURED PRESSURE (PSI)	161.30 177.49 204.99	165.68         2.71           181.22         2.10           209.69         2.29

Figure 65

## IX. Troubleshooting

### QUITS Not Activating -

- 1/ ensure that system set up is set to QUITS ACTIVATED YES
- 2/ ensure that a channel capacity is entered in the module delay screen
- 3/ ensure that a value or percentage is chosen for all desired channels in SET QUITS screen

## UNABLE TO INITIALIZE 1608FS (SEISMIC)

Wa	iting For Seismi Trigger	c
_	Cancel	
CP	TSND	<b>x</b>
l	INABLE TO INITIALIZE	1608FS (SEISMIC)
		ОК

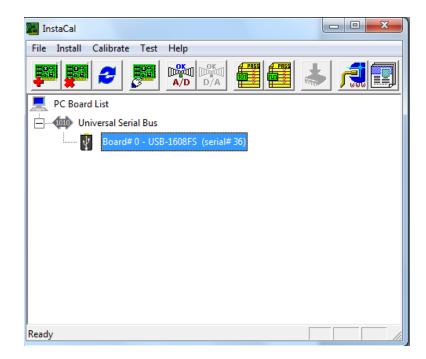
Click okay and then click okay again on below tab

	Waiting For Seismic Trigger		
PTSND	Canadi		×
	RUN INSTACAL. CPTSND WILL CL SESS CANCEL TO RETURN TO CPTS	and the second se	NEED TO BE

If this does not start the INSTACAL program then return to the start menu and find MEASUREMENT COMPUTING in the program list. Run the Instacal program, click on the add board icon and the USB 1608 should be found, click ok.

File InstaCal	Test Help
PC Board List	Plug and Play Board Detection
Ready	

Instacal should then display the found item as board # 0. Close out of instacal and restart CPTSND.



CPT SND will provide the option to resume the test, follow the prompts and enter back into seismic test and proceed.