SC-XT2000

CROSS HOLE ULTRASONIC LOGGING SYSTEM FOR FOUNDATIONS

OPERATION MANUAL

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IMPORTANT

It is Important that you read Chapter 6 of this manual - Equipment care and troubleshooting - before using the SC-XT2000 system

CHAPTER 1 : INTRODUCTON

1.1 WHAT'S IN THIS MANUAL

Thank you for purchasing Sonic Coring XT-2000, the cross hole ultrasonic logging test equipment for foundations. This manual describes the SC-XT2000 equipment and software and how to connect it and use it to acquire data. It gives practical information such as cable wiring details, equipment listings etc. It also describes a typical test sequence in outline.

1.2 SUMMARY OF TEST PROCEDURE

The equipment is purposed designed and manufactured specifically for carrying out sonic logging tests on concrete foundations that are equipped with access tubes. Sonic logging, or sonic coring as it is often called, consists of measuring the transit time of an ultrasonic signal between two tubes, cast into the concrete foundation. Two probes are used, one an emitter, the other a receiver. Both are connected via cables to the main acquisition equipment. See Fig 7.

In practice, the tubes are filled with water to act as a coupling medium and the probes are lowered down to the base of the tubes. They are then raised in unison, over the winch, the emitter sending a pulse every 20mm of pile depth. The signal travels through the coupling water, through the tube, through the concrete and again through the tube and water to the receiver. The signal detected by the receiver is displayed on a time scale so that the first arrival time (FAT) is clearly visible. As the probes are raised, a series of these signals are built up to form a semi-continuous log known as a sonic profile.

The winch has two main functions. The first is to initiate a emission pulse every 20mm and the second is to measure and control the depth scale on the sonic profiles.

Most foundations will have more than two tubes, four is typical for a large diameter pile shaft.. In this case, sonic profiles can be made between all pairs of tubes, 1-2, 2-3, 3-4, 4-1 and the diagonals, 1-3 and 4–2.

All the data is saved on the computer and the profiles are immediately visible on the computer screen. The initial interpretation can be done immediately, on site and a more detailed appraisal, including printed report can be done in the office.

CHAPTER 2 : SYSTEM & HARDWARE

2.1 SC-XT2000 SYSTEM COMPONENTS

The kit contains the following items :

- Rugged Military Spec portable computer
- Acquisition board, power supply installed inside computer.
- Manual winch
- Emitter Cable reel
- Receiver Cable Reel
- Winch Cable Reel
- Emitter probe
- Receiver Probe
- Connecting cable from PC to Winch Reel
- Connecting cable from PC to Receiver Reel
- Connecting Cable from PC to Emitter Reel
- Surveyors Tripod
- Software SCAP (Sonic Coring Analysis Programme)
- Instruction Manual
- Waterproof orange case for winch and cables.

2.2 SITE COMPUTER

The site computer supplied has the following specification:

MIL-STD 810F tested and certified
1.6GHz Intel Pentium M Processor
256MB Ram
40GB Shock mounted HDD
Shower-proof and dust-proof rubber keyboard and touch pad.
12.1” XGA transmissive TFT LCD screen
2xUSB 2.0 Ports
Serial & Parallel Ports
DVD/CDRW drive
Additional 65Whr Li-ion Battery pack
12-32VDC power adapter/charger
Carry bag
Microsoft Windows XP Pro
SCAP - Sonic Coring Analysis Program

Charging the Unit

To charge the unit, connect the AC adapter. An indicator light on the Site computer will show that charging is in progress. Full details are included in the Site computer manual.

2.3 ACQUISITION BOARD AND POWER SUPPLY

Installed within the computer is a 1 Mega samples per second, 12bit, ADC converter. Also installed is a power supply to drive the piezo ceramic emitter.

The control panel has three Lemo sockets which connect to the cable reels. This is shown in Fig 7 in the appendix and in a photograph below.

Please be aware that the emitter is driven by a 800 volt, 10milli-amp supply. This is a very short impulse supply and is not dangerous. It can however give an electrical shock and you should not disconnect any of the connectors on the emitter supply line when the programme is running.

The system is designed to comply with the following standards:

AFNOR NFP94-160-1
ASTM D670-02

2.4 MANUAL WINCH

The winch screws onto a standard surveyors tripod and consists of :

Wheel.

In operation, the two cables from the probes sit in the recess in the aluminium wheel. As the probes are pulled up the wheel rotates and the steel screws in the side of the wheel pass a proximity sensor built into the control unit. Each time a screw passes the sensor it initiates an emission pulse. There are 24 screws in the wheel and the internal circumference of the wheel (allowing for the effect of the cables) is 480mm – thus one revolution equates to 480mm and the distance between pulses is 20mm.

The wheel runs on a double sided, waterproof sealed, bearing. It does not need any servicing but should be kept clean.

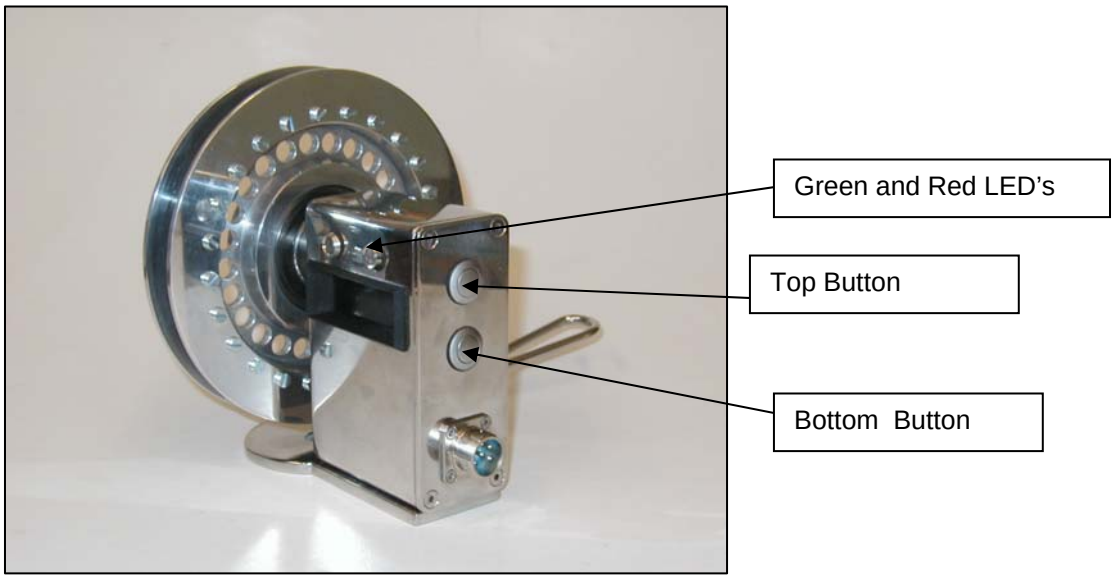
Cable guide

This is simply to ensure that the cables are kept together as they pass on to the winch wheel.

Control unit.

This is used to display and control the test procedure. The operation of this will only become clear when the user is familiar with the software, SCAP.

Assume that the software is running and the probes are in tubes 1 and 2.



There are two buttons on the side of the winch which allow the operator to control the testing and data storage operation without having to keep returning to the testing vehicle and the computer. There are three different modes as follows:

IDLE Mode

In this mode you can toggle between tube pair and depth. These are indicated on the red LED screen on the winch control unit. Again, in tube pair mode you can then toggle to select the pair required. Once the correct pair has been selected, press the bottom button to return to depth mode, then press and HOLD the top button to go to the TESTING Mode and start testing. In IDLE Mode, no lights are on.

VERIFICATION MODE

If you wish, you can verify that the probes are working correctly and that they are level in the pile by pressing the top button once (and NOT holding) in the previous mode. This will take you to VERIFICATION Mode and will show the signal amplitude on the red LED display. At the same time a time trace window will open on the PC to view the signal. Amplitude can be selected by clicking on the value and scrolling down (or using the up/down keys). The operator can move one probe up or down to achieve the maximum amplitude which will indicate that the probes are level.

In this mode the green light will be flashing.

TESTING MODE

Testing mode is activated by pressing and holding the top button, until the green light is on constantly. The bottom button is not activated in this mode, during which data is being transmitted to the computer and stored. To exit testing mode, i.e. after test is complete, press the top button once. If the red LED comes on during testing, it means that you are raising the probes too quickly. If in doubt, pull the probes at a slower rate.

2.5 EMITTER CABLE REEL

The emitter reel has 50m or 100m of cable and one 4 pin Jaeger socket in the centre. As mentioned earlier, be aware that this line carries 800 volts.

2.6 RECEIVER REEL

This contains 50m or 100m of cable and has three sockets. The 6 pin Jaeger connects to the computer, the two 3 pin Jaeger sockets are not used. Note that the plugs and sockets are all different and it is not possible to connect incorrectly.

2.7 WINCH CABLE REEL

This contains approximately 50m of cable and terminates in a 6 pin Jaeger connector that plugs in to the winch. On the cable reel flange is a 6 pin Jaeger plug for connection to the rear of the computer.

2.8 CONNECTING CABLES

These are all self explanatory and we note that incorrect connection is not possible due to the varied number of pins and /or keyways on the connectors.

CHAPTER 3 : BASIC THEORY

The Sonic Coring test was developed by Monsieur Jean Paquet in the 1960's. The main improvements to the system since then have been:

- Rapid digitisation of the signals
- Digital storage of the whole of the signals

The sonic coring test is described in a CIRIA , Report 144, "Integrity Testing in Piling Practice" dated 1997. (ISBN 0 86017 4735). A knowledge of some of the concrete properties and simple formula are useful for a greater understanding of sonic coring.

C Longitudinal Wave velocity in the pile. Normal value for concrete is 4000 m/sec but will vary depending on the type of aggregate, amount of cement, density and other factors. Grout may be as low as 3200 m/sec and very high strength precast concrete can be up to 4500 m/sec.

Also $C^2 = E/\rho$

V Confined, Ultrasonic pulse velocity. This is different to the longitudinal wave speed and depends on Poissons ratio as follows:

$V^2 = E/\rho\ (1-\mu)/(1+\mu)\ (1-2\mu)$

This value is higher than the C value by a factor of about 1.08

ρ Density of concrete in Kg/m^3 Normal value would be about 2400 Kg/m^3. Poor concrete would be 2300 Kg/m^3 and badly voided or honeycombed concrete could be less than 2000 Kg/m^3.

The density of steel is 7800 Kg/m^3 and does not vary significantly

E The dynamic modulus of concrete and varies from about 28 – 40 GPa.

μ Poissons ratio . This varies from about 0.16 – 0.25.

It is not generally advisable to use the first arrival time to try and calculate the wave speed in the concrete. Firstly, the signal is influenced by the access tube, the water and the interfaces between them. It is also rare that the exact spacing between the tubes (except at the top of the pile) is known.

CHAPTER 4 : SITE OPERATIONS

4.1 INSTALLATION OF TUBES

Tubes for sonic coring should be mild steel and not less than 38mm internal diameter. This type of tubing is normally supplied in 6.5m lengths, “screwed and socketed”. Both ends will have a screw thread, one end having an external coupler screwed on.

PLASTIC TUBES ARE NOT SUITABLE.

The installation of these tubes is normally done by the piling contractor and it is important to take care during the installation to ensure they do not become bent, blocked or otherwise unusable. Joints should be tight and waterproof. Normal tightening with some grease on the threads is adequate. Do NOT encase the jointed area in waterproof tape as this will spoil the signal transmission.

On a pile, say 1050mm diameter, there would normally be four tubes and these would be fixed to the inside of the reinforcing cage.

The bottom end of the tube should have an end plug screwed on and the tubes filled with water BEFORE the concrete is placed. It is also advisable to have a top cap to ensure the tubes do not get blocked with concrete or stones.

Once they become blocked, it is very difficult if not impossible to unblock them.

4.2 PRE - TESTING

Before starting to test it is advisable to ensure that you have site data concerning the piles.

- Pile construction methodology
- Piling records – any problems during concreting?
- Pile type and diameter
- Pile toe level, Bottom of tube level, Pile cut-off level, tube top levels
- Tube orientation
- Tube length

These can be entered on a check sheet, an example of which is shown in Appendix **8**. Check that the tubes are all full of water. They use more water that you think and a bucket full of water is not enough to fill even one tube.

4.3 TESTING

Set up and connect all the equipment as shown in Fig 7.

Lower the probes to the base of the pile in say, tubes 1 and 2. If you know the tubes are the same depth then you can simply lower both probes to the base. If this is not necessarily the case, then you do need to set the probes at the same horizontal level and lower them together.

Set up the winch on the tripod a convenient distance from the pile, something between 2 and 4 m is OK.

Lead the cables from the top of the tubes to the winch, try and ensure that the cables are free to run and are not impeded by reinforcing steel or the like. You should always use a non-abrasive guide on the top of the tubes, to prevent damage to the cables.

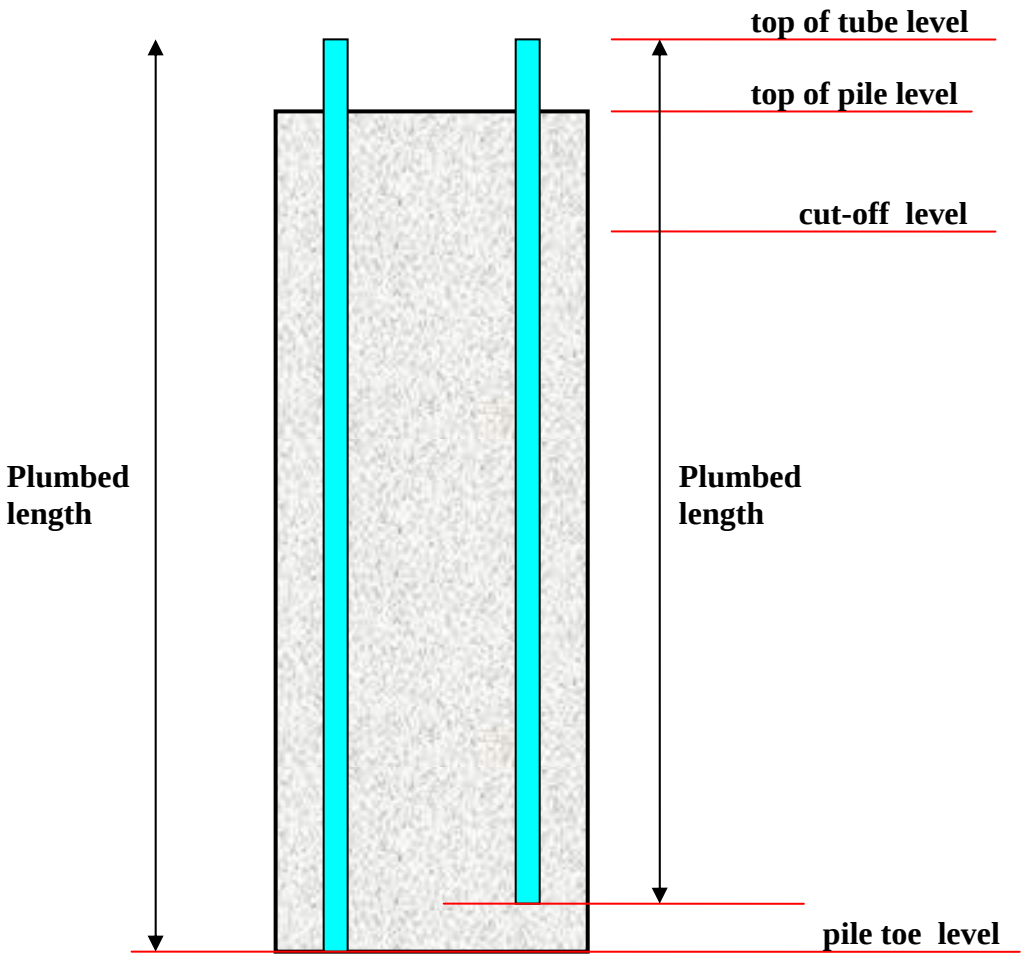
Switch on the computer and start the SCAP program – Details are given in section 5 on how to operate the program and carry out the testing. Check the battery level indicator to ensure you have sufficient power.

The winch has buttons that enable you to continue testing, WITHOUT HAVING TO GO BACK TO THE VEHICLE /COMPUTER. You can simply move one probe from say, tube 1 to tube 3, lower them to the base and using the buttons on the winch select the tube pair you are testing.

4.4 REFERENCING OF LEVELS

Difficulties can arise concerning the reference levels of sonic coring traces. It is important that this is determined, to ensure that the full length of the pile is checked and that the depth of any anomalies can be referenced clearly with a known datum.

The best datum to use on site is the site reference level. As far as the test is concerned the limits of the test are the top of the tubes and the base of the tubes. Tubes can be cut down or extended after testing so it is best to determine the cut off level and reference profiles to that. To do this, we must obtain at least the cut-off level and tube top levels on site.



Reference Levels

CHAPTER 5: OPERATION OF SCAP SOFTWARE

5.1 PROGRAMME INSTALLATION

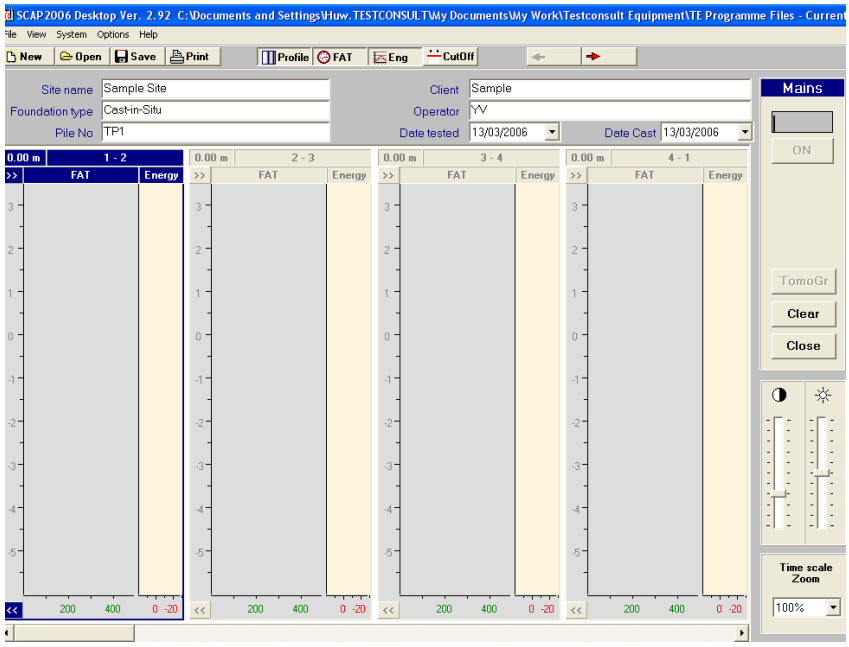
The SCAP program (Sonic Coring Analysis Program) is already pre-installed on the Site computer. A copy of the programme is also supplied on CD Rom in the event that the program needs re-installing.

5.2 OVERVIEW

The SCAP programme enables you to enter the site and pile details, look at individual signals, build up sonic coring profiles in waterfall view, to display first arrival time profile and to display the signal energy. The program controls the signal amplification and uses information input about pile levels to show pile depths relative to site reference levels or the top of tubes. The program also puts the results in a format for printing.

5.3 START UP

To start the SCAP program, double click on the SCAP icon on the screen. The following screen will appear;



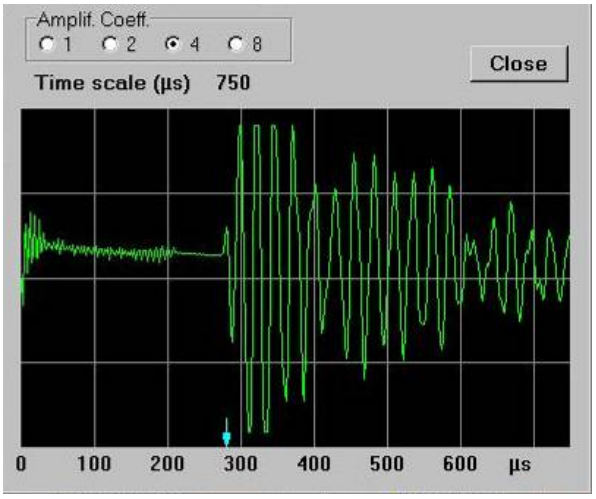
Once all of the cables are connected, click on the Mains - On button to activate the acquisition board and the winch. The box below mains will go green and a line should move from side to side if the winch is communicating with the computer.

You will be prompted to test a new pile, continue testing and existing pile or to cancel with a pop up screen. For a new pile a new file name must be chosen.

Enter site name, foundation type, pile number, client, operator the date tested and the date cast in the boxes.

5.4 CHECK AND SET UP THE SIGNAL

To check that the probes are connected and working, click on View/Signal or F5 and a box will appear on the screen. click on the Test button or System/Test on the tool bar and the probes will start clicking. The following display will be shown on the screen. Alternatively, pressing the top button briefly will do the same. The green light will be flashing on the winch.



This shows the signal at the current probe position. The amplitude can be altered by selecting a suitable coefficient. Aim to just fill the screen. The time base can also be altered in this mode. You will need to press the stop button on the screen first.. Aim for the first arrival to be about two thirds of the full scale . Click on close and the box will disappear. If there is no signal, the probes may not be level, or one tube is blocked. Press top winch button to stop.

5.5 START TESTING

The operation of the programme during testing is all operated from the winch. The winch LED should be off, indicating it is idle. Click on the bottom button until the LCD display on the winch shows a tube pair configuration, like below;

Press the top button until the tube pairs you are testing show. Click on the bottom button to get to depth measurement, as below;

If both probes are at the bottom, press and hold the bottom button to reset depth to zero.

5.6 VERIFICATION

To check the amplitude of the signal, press the top button. The winch LED will start flashing and the emitter will start clicking. To exit press the top button again.

The amplitude display shows the amplitude of the signal as a percentage of full screen, and should be at least 50%, as displayed below;

The aim of the verification, is to ensure that the probes are horizontal. This should be the case when the distance between tubes is at a minimum and the amplitude of the signal is at a maximum. This is a useful check if the base of tubes are blocked.

5.7 DATA ACQUISITION

To start acquiring data, press and hold the top button. The message ‘rdy’ will appear momentarily and the winch Green LED will be on continuously when it is ready to start acquiring data.

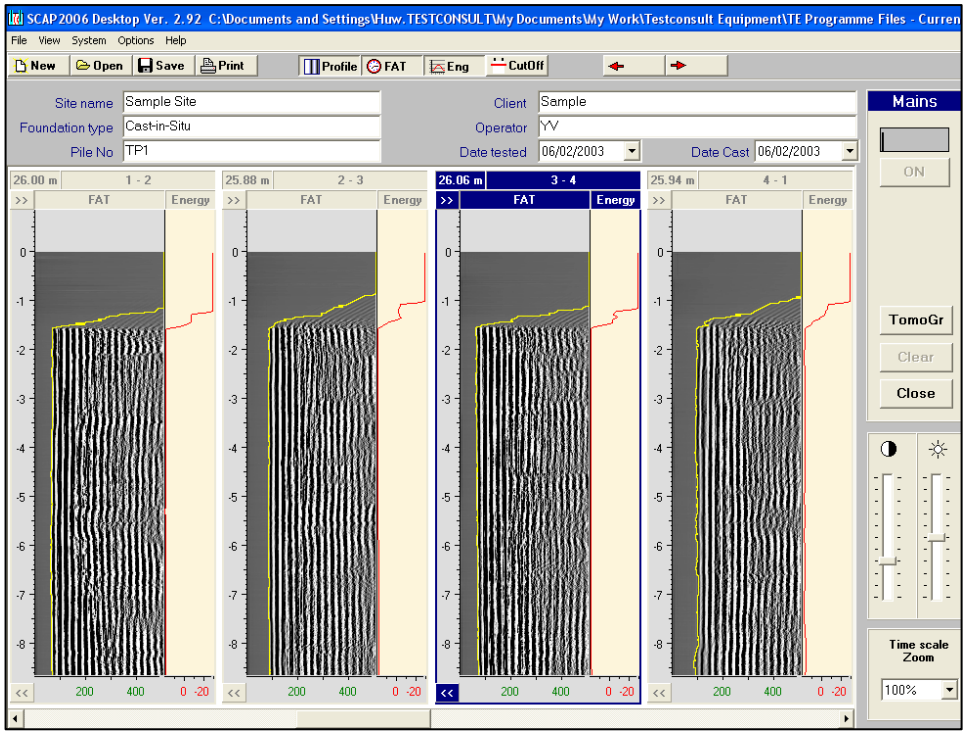
The winch LCD will show the depth of the probes, commencing at zero. Start pulling the cables at a constant rate. If you pull the cables too fast, data will be lost, and the winch LED will show red (in practice the winch can be pulled very fast). The winch LCD will show the distance you have raised the probes. When you reach the top of the tubes, press the top button the put the winch in idle mode. Check that the depth on the winch (actual depth of test) corresponds with the depth shown at the top left hand side of the profile (depth recorded by logger) and shortfall indicates that data is lost because of excess speed.

Note: For piles in excess of 100m, the winch counter resets itself to zero at 100m and will continue up to a maximum of 50m (150m). The counter on the computer screen will however record as normal.

Alternatively, you can start the test from the computer. Click on the start button or System/Start and wait for the winch LED to show green continuously then start pulling the cables. Press the stop button to stop the test.

As you pull the cables, a waterfall profile is automatically produced on the computer screen. Once the top button is pressed, it will put depth measurements on.

To select the next profile, press the bottom button to select tube pair menu and the top button the choose the correct tube numbers. Return to depth mode by pressing the bottom button. Once the probes are set at the bottom, hold to reset to zero depth and then press and hold the top button to start testing. If levels are entered for tubes, the program will automatically adjust the profile position depth wise relative to each other.



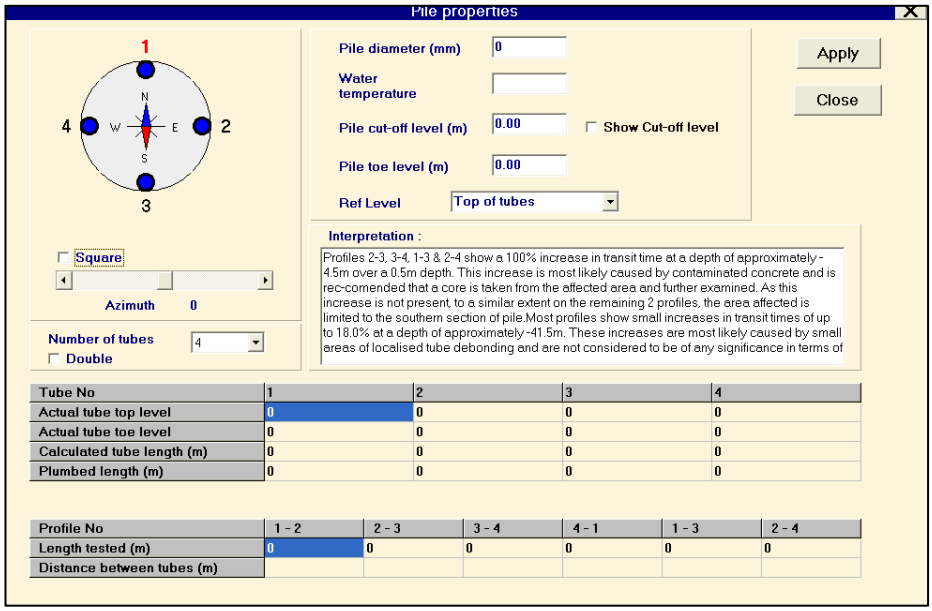
You can choose to display the first arrival time trace (FAT) and the signal energy (ENG) by clicking the buttons on the top of the page. The contrast and brightness of signals can be altered using the contrast sliders at the bottom right of the display.

If you want to redo a profile, click on the profile and click on the 'Clear' button. Then carry out the test as before, selecting the same profile on the winch.

You can check the amplitude of the signal at any point of each profile, by first clicking on the profile and the either press F5 or View/Signal. The signal will be displayed as in the verification section - 5.4

5.8 ENTERING PILE PROPERTIES

Pile data is entered on a separate display, which appears if you press F4 or View/Pile properties. The following is displayed;



It is as well to obtain all this information before testing. A useful sheet is given in the appendix, which can be given to the contractor to complete before you arrive on site. We would recommend that you stick to the same tube orientation for all piles. i.e. make the tube closest to North, tube 1 and number the others consecutively going clockwise.

If you check the 'show cut-off level box, and a cut off level and tube top level is entered, a red line will automatically show cut-off level on the profiles. The reference level will then be absolute. If you do not have the tube levels, the reference level will automatically be the top of the tubes.

Enter your interpretation for the pile, once you have finished testing. Press apply to confirm.

5.9 FAT SETTINGS

It is now possible to alter the FAT settings to ensure that you obtain the true first arrival. Press F5+Shift to bring up the window and click on the profile you want to alter.

click on manual and then you will be able to alter the Threshold level and the Time "dead zone".

Increasing the FAT threshold will desensitise the FAT picking and should be used when you have strong signals. If the signal is weak, it is best to decrease the FAT threshold to ensure the correct signal is not missed. The time dead zone effectively ignores the effect of signal noise and sets the point in time after which the signal is analysed.

Click on "apply" to apply only to that profile. Click on "apply to all" to apply to all profiles. These settings will be saved when you click on save.

5.10 CALCULATION OF FAT AND ENERGY CHANGE

Bring up the individual signal by clicking on the profile and then F5+Shift. To move the analysis point line, press shift and then click where you want the line.

Grab and move the profile down to so the anomalous area is behind the analysis point line. Press ALT and then click and drag over a good area above the anomaly, then release. The area selected will be between two white lines. Click and drag over a good area below the anomaly, then release. The area selected will be between two blue lines. A calculation window will appear which will show the relative change in FAT and signal energy. Click on the arrow to mark up the trace.

Right click on the trace will give you the option to remove the calculation lines and/or the calculation.

These calculations are not saved.

5.11 TOMOGRAPHY

This programme enables you to look at the changes in FAT in 2D and 3D. It can only be used when you have 3 profiles (3 tube pile) or 6 profiles (4 tube pile). It should only be used when you are sure the FAT settings are correct. Click on "Tomo Gr".

Changing the pixels alters the resolution, but also the speed of the calculation. Always click on apply after any changes. If you alter the rotation you must also click on apply.

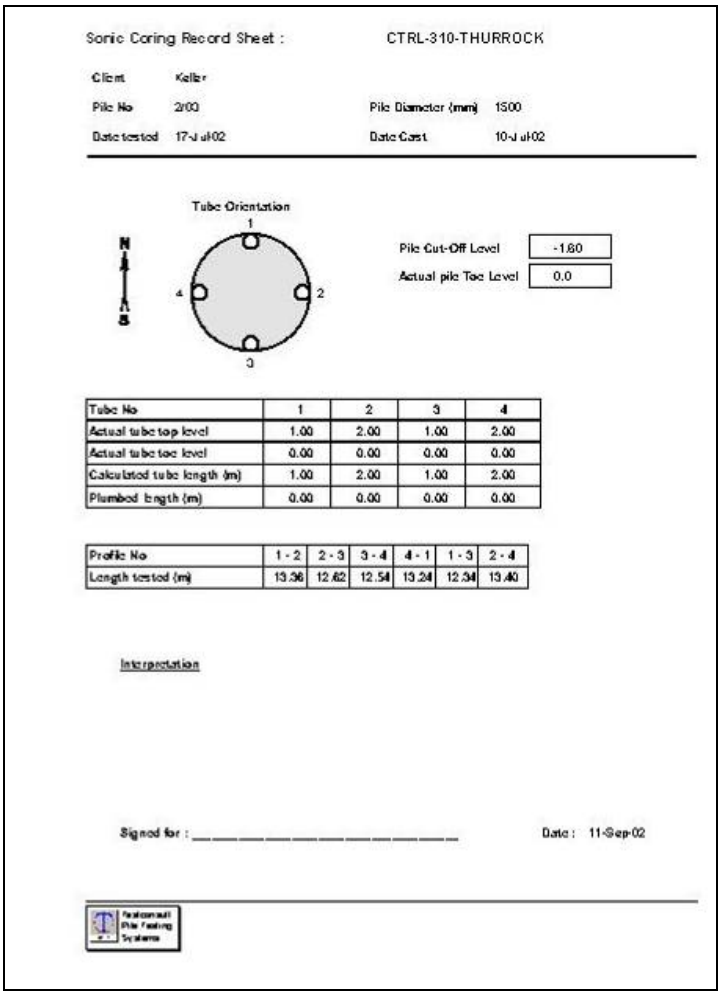
Click on the up and down arrows to view a 2D tomographic slice through the pile. You can alter the contract to alter the viewing effect of any changes FAT. To zoom in on an area, highlight the area by clicking and dragging a square down over the area, then use the up and down arrows. To zoom out, click and drag back up over the area.

2D tomography views can be saved by double clicking inside the image. This will temporarily save the image and the depth for printing. To remove a selected 2D image shift+click on the image. To view a 3D cylinder, click on draw.

The tomography program is not intended as an absolute indicator of defective areas. It should be used to view the composite effect of areas of signal change, to help you decide on affected areas.

5.12 REPORTING

The final report is displayed by pressing the print button. This will print out a reference sheet first, giving all the pile details and properties. Printouts of the profiles, as selected by you are then printed. See below;



Sonic Coring Record Sheet : CTRL-310-THURROCK

Client Keller

Pile No 2/00 Pile Diameter (mm) 1500

Date tested 17-Jul-02 Date Cast 10-Jul-02

Tube Orientation

Pile Cut-Off Level -1.60

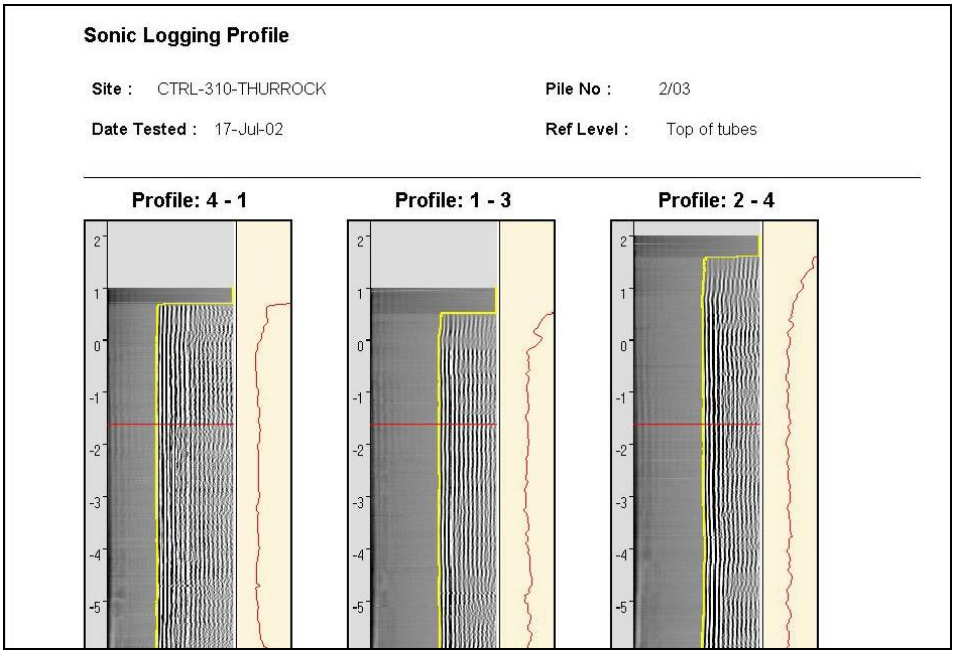
Actual pile Toe Level 0.0

Tube No	1	2	3	4
Actual tube top level	1.00	2.00	1.00	2.00
Actual tube toe level	0.00	0.00	0.00	0.00
Calculated tube length (m)	1.00	2.00	1.00	2.00
Plumbed length (m)	0.00	0.00	0.00	0.00

Profile No	1 - 2	2 - 3	3 - 4	4 - 1	1 - 3	2 - 4
Length tested (m)	13.36	12.62	12.54	13.24	12.34	13.40

Interpretation

Signed for : _____ Date : 11-Sep-02



The printout has a space at the bottom for you to sign and date results.

In the PC version of the software, you have the option to print test results in vertically compressed format (for very long piles), which will make the result fit on one page or uncompressed. Select using Print > Compressed or Print > Uncompressed.

5.13 FILE HANDLING

Profiles are automatically saved at the end of each test, to the file name chosen when the test was started. Files can be moved and transferred just as any other file. Please note that the data files are very large (2 MB+). To transfer files, we recommend using a USB Mass storage device or an external CD-RW device which is supplied. To start on a new pile, click on the New button or File/New. To open an existing file click on Open or File/Open or F3 and look for the file in saved location. If you wish to amend an existing file that has been saved, you will need to open the file and select the profile to re-test. To clear the existing profile press start then stop, then the clear button. This is a safeguard to prevent profiles being deleted in error.

You can specify a default data directory in which to store files. Select this option using Options > Data Directories

5.14 EXPORTING DATA

You can export FAT readings in ASCII format if required. Select FILE > Save as ASCII, and data points are stored in a separate file for each profile.

5.15 COMPANY LOGO

To import your own company logo for each printed page, select Options>Report LOGO. The logo file should be in JPEG format, which does not distort when reduced.

5.16 TURNING OFF

To exit the program click on Exit.

5.17 SUMMARY OF QUICK KEYS

A summary of the quick 'F' keys is given below.

F2	File Save
F3	File Open
F4	Pile Properties
F5	Signal View
F5+Shift	FAT Threshold Settings

Please note ; In some modes you may have to wait a couple of seconds before entering the next level.

CHAPTER 6: CARE & TROUBLESHOOTING

6.1 SITE COMPUTER

The A770 site computer is housed in a tough aluminium alloy case. This does not mean it is designed for rough use on site, and should not be subject to unnecessary shocks or drops. We recommend transporting the site computer in a well padded protective case when freighting.

We recommend that you do not install any unnecessary software on the site computer, as this may lead to system conflicts.

The Site computer has internal batteries that can power the system independently for a short space of time. However, because of the power required for the emitter, if you are using for long durations, we recommend that you power the unit with 12V (using the converter) or AC from a generator.

6.2 PLUGS

Take care with the screw type Jaeger connections, as these can be cross threaded if forced. With Jaeger connections ensure that the pins are correctly aligned before screwing or twisting the collar on.

Both the Lemo and Jaeger plugs are easily repaired by a competent electrician if cables are accidentally pulled out of the back of the plugs. The cables are soldered to pins inside. Ensure that the keyways of the cable clamps and guides are correctly aligned before re-assembling.

The Jupiter plugs connecting the probes are more difficult to re-fit to cables, all though perfectly possible for a competent electrician. The threads of the probe should be smeared with a little petroleum jelly and the connection only hand tightened. For additional protection, the connection can be covered with self amalgamating tape.

6.3 PROBES

The Emitter probes are sealed in resin and cannot be taken apart or repaired. Any attempt to do so will destroy the probe. They are relatively brittle and care should be taken not to stand on them or knock excessively. This will crack the resin and destroy the probe permanently.

The receiver probes are filled with a neutral oil, in which the receiver electronics are suspended. It is possible to carefully unscrew the top of the probe to check that the oil is full (if not you can top up with ‘baby oil’). You can also check that the receiver ceramic is

connected to the amplifier board (we would recommend that this is done by an experienced electrician) Again, the tube is brittle and must be protected on site.

Both probes should be handled with care and should not be dragged along the ground, left lying on the ground or dropped.

6.4 CABLE CARE

The most vulnerable pare of the system is the cables connecting the probes. These are subject to wear and tear as they pass over the tops of the tubes. It is essential that you use a cable guide to prevent wear. We would also advise carrying a round file, to remove burrs from the internal edge of the tube orifice. Occasionally contractors will cut the tubes with a steel saw, leaving razor sharp edges. Without care these can cause nicks and cuts in the cable. This will allow water to enter the screening of the cable, which will lead to a deterioration of signal quality – usually evident by high signal noise over the initial part of the signal. You should check the cables regularly and tape over any cuts that you find.

It should be remembered that 40m down a tube filled with water is the same pressure as 40m below the surface of the sea. The cables are subject to very high water pressure near the probes, which will enter cuts and travel up the screening if left. This can lead to deterioration of the signal and can be remedied by removing a few metres of cable or replacing if old or worn.

You can check the insulation of cables when not connected, by using a multimeter to measure the resistance between the insulated signal wires and the screen/connector bodies. This should be greater than 20MOhms.

6.5 TESTING

If you are not receiving a signal, this may be due to the following:

Cables not connected!
Probes too far apart
Emitter not working
Receiver not working
Acquisition board driver error.

Firstly, double check all cables are connected correctly.

Secondly, raise probes from the base of the pile a couple of metres. It is not uncommon for the base of piles to be contaminated.

Thirdly, pull the probes to the surface and check they are level. If not, lower in unison and ensure they remain level.

Fourthly, Put the probes into a bucket of water and check with the 'Test' feature.

Emitter is not working: you will know because it is not clicking!. Try another emitter probe if you have one, otherwise the problem may be with a cut in the cable, a loose wire in a plug or a corroded terminal. Check and repair. It is not possible to repair the emitter probes.

Receiver is not working: If the emitter is clicking and you have no signal, try another receiver if you have one, other wise the problem may be with a cut in the cable or a loose wire in a plug. Check and repair. A possible but unlikely last resort, is that the oil has leaked out of the receiver or the ceramic pickup has become detached from inside the probe. See section on probes above.

If none of the above apply an acquisition board driver error may have occurred. It is possible in windows to refresh the driver by carrying out the following:

1. Go to Start->Settings->Control Panel.
2. Double click on the LCard Setup.
3. The message "Found PCI boards: L783 ... IRQ 10" should be displayed at the bottom.
4. Click OK button and the driver settings will be refreshed.

If you see a fault at regularly spaced depths:
This may not be due to the concrete at all, it could simply be that the joints between tubes have been wrapped in densotape or smeared in grease to protect them. This will lead to a severely damped signal. However, this can be checked by comparing with the length of tubes installed, measuring from the base, as the top tube will probably be cut.

If probes become jammed in tubes
This can sometimes occur if a stone falls down the tube on top of the probe and jams between the tube wall and protective boot. **DO NOT panic and pull the probe cable**. This will only jam the probe further and may even snap the cable at the plug. loosing the probe altogether!

Try gently jigging the probe lightly. The stone may pass the boot and probe. If the probe is near the top, lower rods to the level of the top of the probe and use to dislodge the stone as you raise the probe. If the probe is deep, lower a bar of steel on cable to the level of the top and use as above.

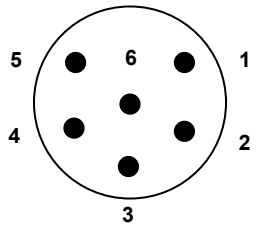
Keep trying – given the cost of replacing the probes it is worth the effort. It is best to prevent this by ensuring that tubes are at least 100mm above the surrounding concrete/ground and removing all loose material before you test. Also plumb the tubes with a metal bar of similar diameter to the probes.

APPENDIX

1. **Wiring for cable from Site computer to Winch reel**
2. **Wiring for cable from Site computer to Emitter reel**
3. **Wiring for cable from Site computer to Receiver reel**
4. **Wiring for Receiver reel**
5. **Wiring for Emitter reel**
6. **Wiring for Winch reel**
7. **General connection arrangement**
8. **Sonic coring reference sheet**

Fig 1. Cable From Site Computer To Winch Reel.

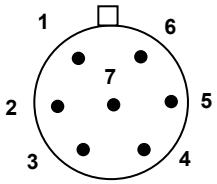
6 Pin Jaeger Cable Socket.
To winch reel
(solder side)



8 Core Screened cable

Pin 1	**= SDA Signal**	**Yellow**
Pin 2	**= +12V**	**Red**
Pin 3	**= Ground**	**Black**
Pin 4	**= SCLK**	**Green**
Pin 5	**= Synch**	**Violet**
Pin 6	**= D Out**	**White**
Casing	**= Screen**	

7 Pin Lemo Cable Plug
To computer
(solder side)



Use red strain relief

8 Core Screened cable

Pin 1	**= Ground/Screen**	**Black**
Pin 2	**= D Out**	**White**
Pin 3	**= SDA Signal**	**Yellow**
Pin 4	**= SCLK**	**Green**
Pin 5	**= Synch**	**Violet**
Pin 6	**= +12V**	**Red**

Fig 2. Cable From Site Computer To Emitter Reel.

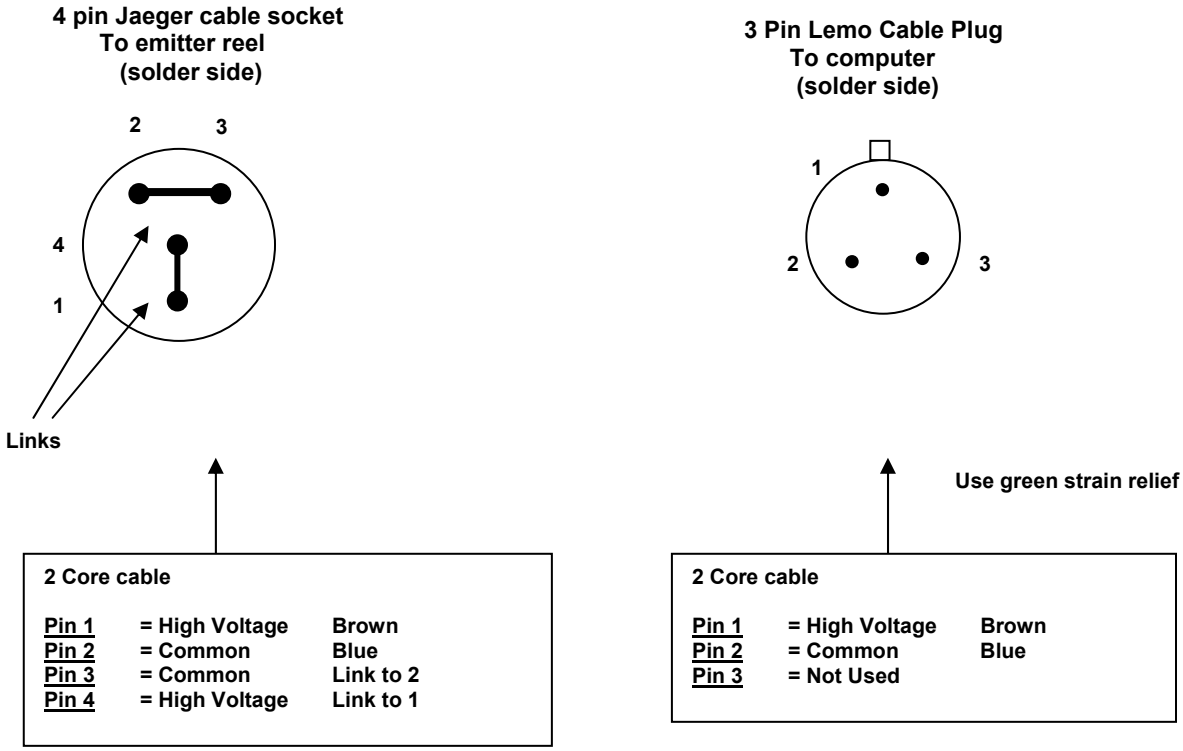
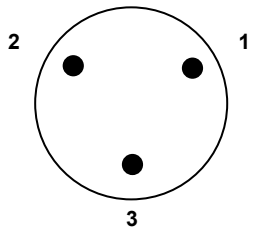


Fig 3. Cable From Site Computer To Receiver Reel.

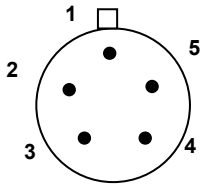
3 Pin Jaeger Cable Socket
To Receiver Reel
(solder side)



4 Core Screened Cable

Pin 1	**= +12v**	**Red**
Pin 2	**= Ground**	**Blue/White/Screen**
Pin 3	**= Signal**	**Yellow**

5 Pin Lemo Cable Plug
To Computer
(solder side)



Use blue strain relief

4 Core Screened Cable

Pin 1	**= +12v**	**Red**
Pin 2	**Not connected**	
Pin 3	**= AGND**	**White**
Pin 4	**= GND**	**Blue**
Pin 5	**= Signal**	**Yellow**

Fig 4. Receiver Reel Wiring

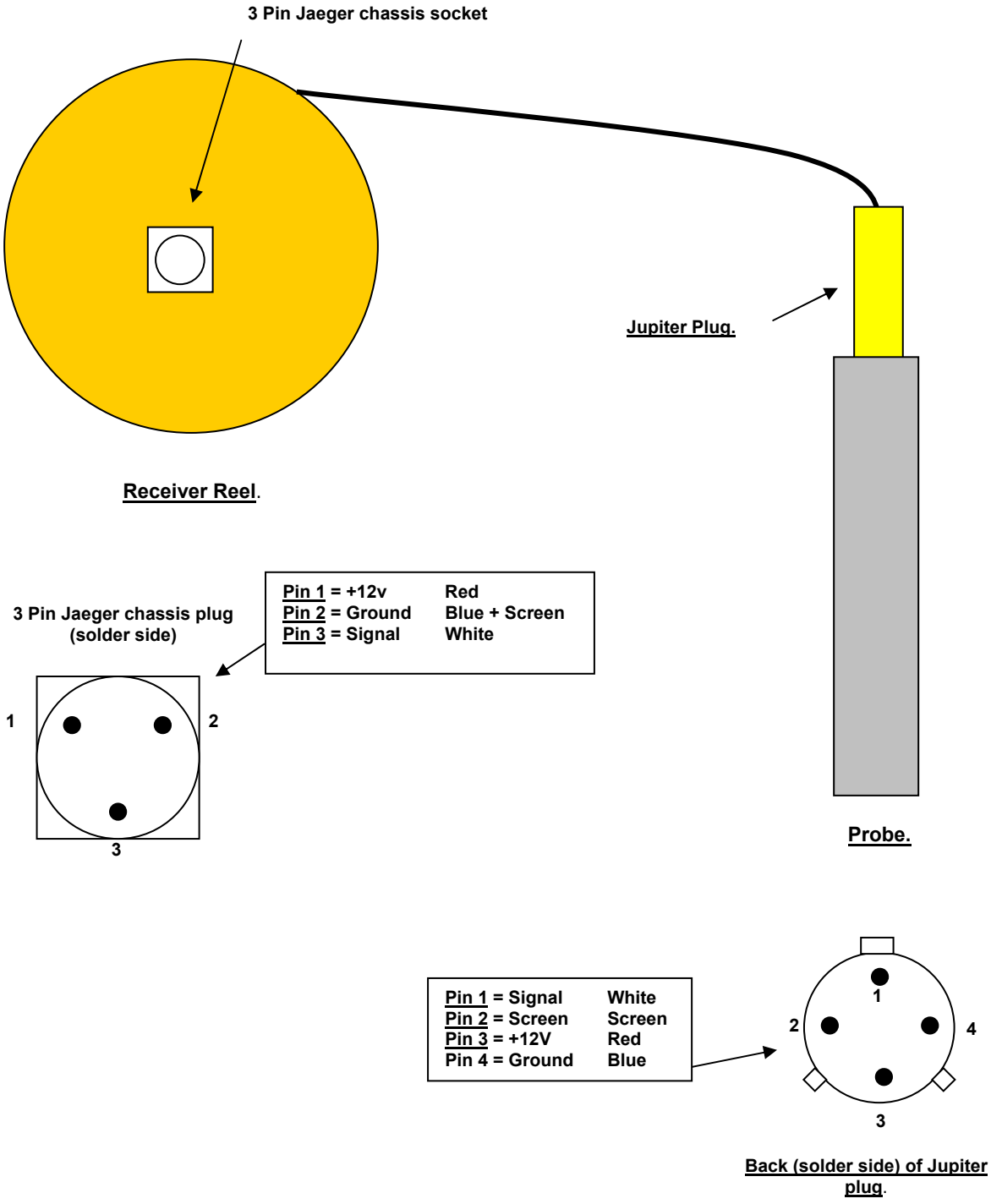


Fig 5. Emitter Reel Wiring.

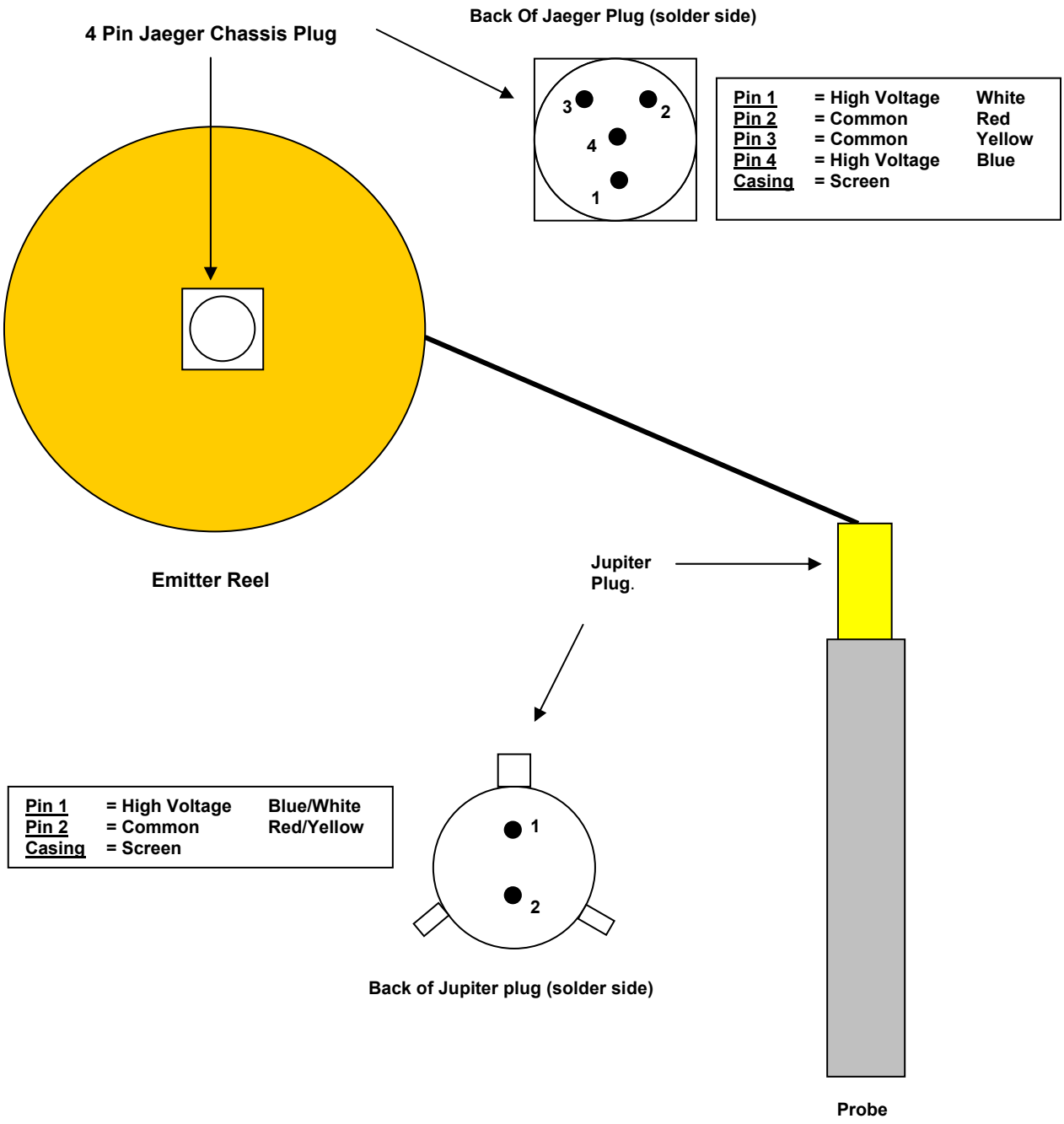
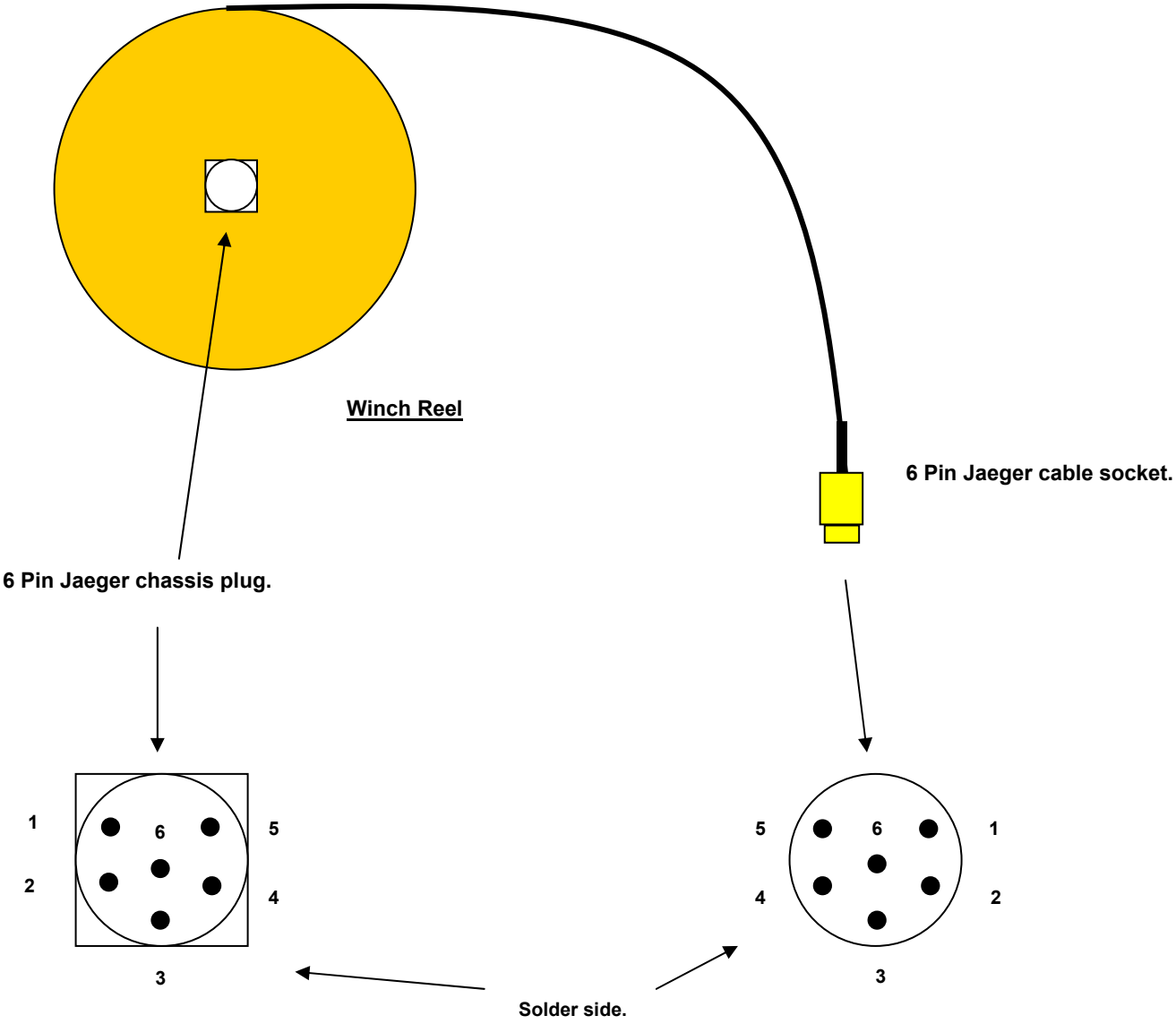


Fig 6. Winch Reel Wiring.

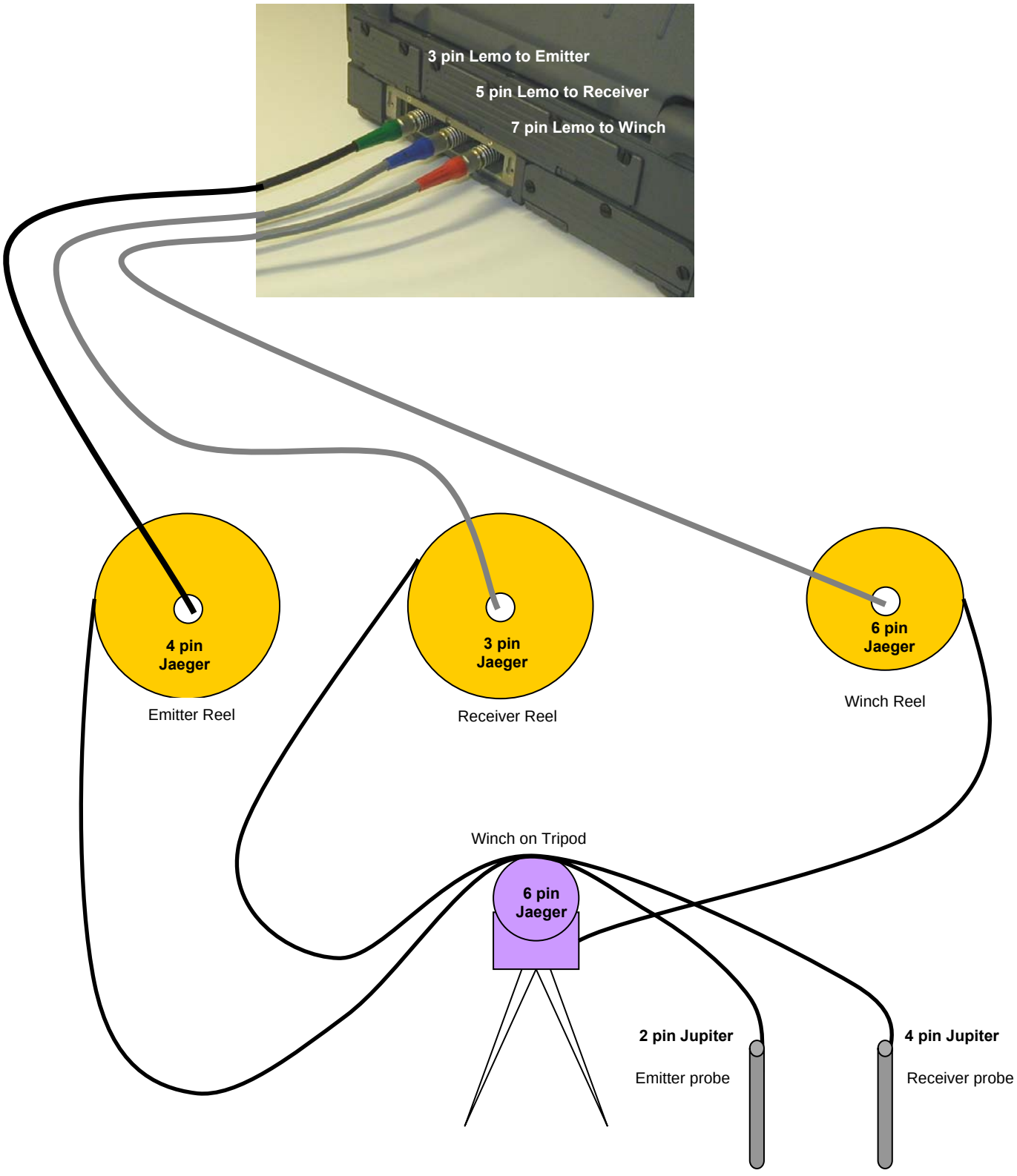


Pin 1	= SDA Signal	Yellow
Pin 2	= +12V	Red
Pin 3	= Ground	Black/Blue/Brown
Pin 4	= SCLK	Green
Pin 5	= Synch	Violet
Pin 6	= D Out	White
Casing	= Screen	

Pin 1	= SDA Signal	Yellow
Pin 2	= +12V	Red
Pin 3	= Ground	Black/Blue/Brown
Pin 4	= SCLK	Green
Pin 5	= Synch	Violet
Pin 6	= D Out	White

Screen is not connected

Fig 7. General Connection Arrangement

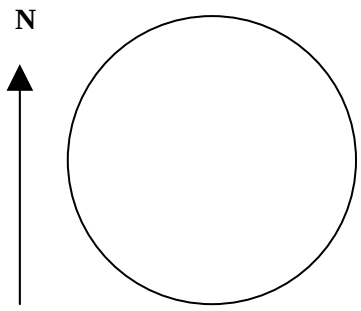


SONIC CORING - REFERENCE SHEET

Project Name :	

Pile Number:		**Pile Diameter (mm)**	
Pile Type:		**Pile Cut-Off Level (m)**	
Date Cast:		**Pile Toe Level (m)**	

Tube Orientation



Comments :

Tube Number	**1**	**2**	**3**	**4**
Actual tube top level (m)				
Actual tube toe level (m)				
Calculated pile length (m)				
Plumbed tube length (m)				
Filled with water ?				

Measurements taken by :	
Signed :	
Date:	