

# 3A-300 Logging System

Installation and Operation Manual





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## DOCUMENTATION CONVENTIONS

This uses the following conventions to present information:



**WARNING**

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.



**CAUTION**

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.



**NOTE**

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

## Section 1: System Description

### Function and Theory

The 3A-300 holds a maximum of 400M of  $\varnothing$  0.10" steel armored logging monocable, and, with the exception of Borehole Video, is compatible with all Delta Epsilon probes and acquisition systems.

### System Components

The 3A-300 incorporates a semi-automatic levelwinding system. When coming out of the hole, you may need to assist levelwinding on the outside edges of the drum to distribute cable evenly. Failure to spool the cable evenly may cause premature damage. This is especially important if your winch has more than 300 meters of cable installed.

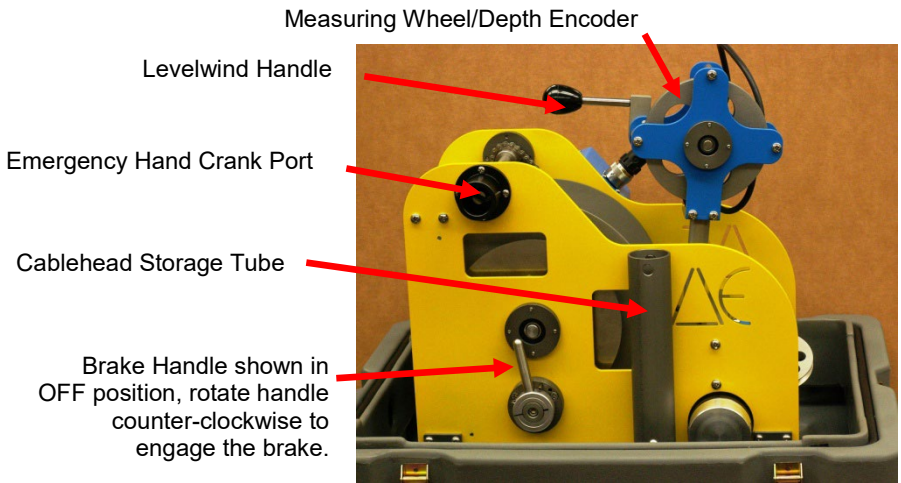


Figure 1-1

The 3A-300 winch is equipped with a manually operated disk brake that is coupled to the winch drum through a one-way clutch. This restricts braking action to downward forces and while offering no restriction when coming up hole. Thus, the brake may be set at the bottom of the hole, and left set during the trip out of the hole. This prevents the probe from creeping downhole when stopped and is especially useful when hand cranking the winch. You may let go of the crank at any time without fear of the probe going back downhole.

All electrical connections to the 3A-300 winch are keyed and are such that making a wrong connection is virtually impossible. Logging requires connecting a maximum of four cables to the winch. One connection for D.C. electrical power, a USB cable to your PC, and, when acquiring electrical logs, two surface electrodes. Approximately 8 meters of the logging cable, on the cablehead end, is sheathed with Nylon tubing. This is to insulate it from the borehole when electrical logs are run. Any nicks or damage to the tubing should be covered with good quality electrical tape (such as Scotch 88).

Depth Encoder connector

Motor Circuit Breaker

Power In connector

Motor connector

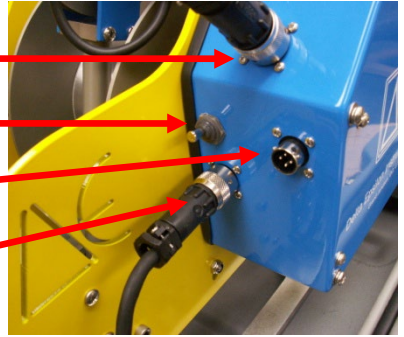
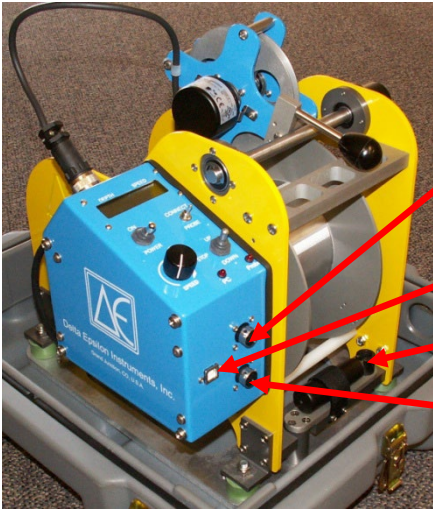


Figure 1-2



'B' Mud plug connectors (both must be used)

USB connector

Emergency hand crank handle

'n' Mud plug connector (both must be used)

Figure 1-3

## Section 2: System Installation

### 3A-300 Motor Driven Winch

The 3A-300 system requires a stable source of 12 to 14vdc at 10Amps maximum for the winch motor drive and electronic circuitry to measure depth, speed and communicate with your PC and the probe. Current draw during normal logging is between two and four amps. Power may be provided by a vehicle battery or similar D.C. power source. Be sure to connect the RED power lead to the positive (+) terminal and the BLACK lead to the negative (-) terminal. To avoid possible short circuits or shock to the operator, the 3A-300 must be used with negative ground systems only.



**WARNING:** The 3A-300 must be used with negative ground systems only!

The UP-STOP-DOWN switch to controls cable direction while the SPEED control allows controlling cable speed from zero to maximum.



**NOTE:** The direction switch is a mechanical hesitation type switch and will only allow toggling from one position to the next without a hesitation (releasing the toggle) before continuing to the next position. That is, the switch cannot be toggled directly from UP to DOWN without a pause at STOP. This prevents accidental damage to the motor and its drive components. It also allows the direction switch's position to safely be changed regardless of the position of the SPEED control.



**CAUTION:** When spooling cable off of the drum (DOWN) be sure to maintain tension on the cable to prevent the cable from becoming loose on the drum. This could cause a loop of cable to cross over adjacent cable or to allow a large loop to fall off the side of the winch drum and become entangled in the chain or brake mechanism.

The winch controller is designed to provide fail-safe operation. If primary power from the battery is not applied or primary power fails, the winch controller will apply maximum dynamic braking. Similarly, when the direction switch is on STOP, maximum dynamic braking is applied. Thus, in normal operation, power must be available in order to pull cable from the drum.

If power is not available and cable must be spooled out, you may disable the dynamic braking by disconnecting the winch motor's cable. With the motor cable disconnected no



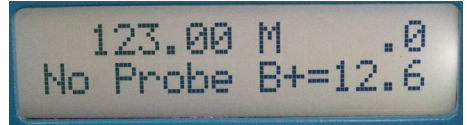
Figure 2-1

dynamic braking can be applied. Motor speed may be controlled with the mechanical disk brake.

Two LED's, "PC" and "Probe" flash briefly when communicating with the PC or Probe.

### Connecting the Winch to a PC

Connect the 3A-300 to your laptop via the USB cable and turn the POWER switch ON (PROBE switch off). On the top line of the display you will see the 3A-300's model and serial numbers displayed for a few seconds, followed by the current depth and logging speed. On the bottom line is a message area, in this case showing "No Probe" is attached and the input power voltage is 12.6VDC. You can now launch DELogger and preset the depth.



Refer to Appendix B for instructions on setting up DELogger's COM port to agree with the COM port Windows assigned to your USB port.

### Connecting a Probe

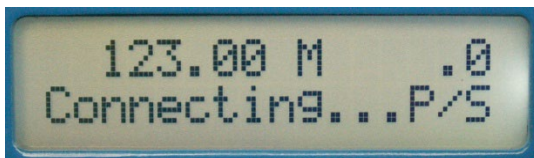
When not in use always keep the probe top and cablehead protector caps in place to keep the connectors, O-rings, O-ring glands, and threads free from dirt.

Set the PROBE/CONNECT switch to PROBE (off) position. Remove the protector caps from the probe and cablehead and apply a thin film of O-ring grease on the cablehead O-rings and mating surfaces. Insert the cablehead into the probe top, aligning the key on the cablehead with the key in the probe top. Press the two together while screwing the cablehead retaining nut onto the probe. When fully assembled the bottom of the retaining nut should come to within about 1/8" (3mm) of the probe top. Do **not** use wrenches to tighten the cablehead retaining nut. Use only normal hand force.

When a probe is properly connected, turn the PROBE/CONNECT switch to CONNECT. During the connection process you will see the following screens while the EPCI circuitry searches for a probe connected to the cable. After a short delay, if the EPCI does not sense a probe it will then cycle downhole power and try again until a probe is detected.



Attempting connection to battery powered probe (such as GE9409/GN9506).



Attempting connection to uphole powered probe.



When a probe is detected its model and serial numbers are displayed for a few seconds.



It is followed by either the state of charge of the probes internal battery (such as with a GE9409 or GN9506 probe) or the voltage of the winch's main input power.



The example above shows the depth at 123.00 meters with a GN9506, battery powered, Gamma-Electric probe whose batteries are at 100%. Beneath it is a GT9502 Gamma probe showing 12.6 volts being supplied to the winch.

### Burying the Surface Electrodes

Surface electrodes are required when using probes measuring electric properties (Short or Long normal Resistivity, Spontaneous Potential, Single Point Resistance, etc.). The Delta Epsilon system uses two surface electrodes (“mud plugs”) which are made of Type 304 stainless steel in the shape of paddles for easy burying and cleaning. Best results are attained when the mud plugs are buried as far from each other as possible and as far from the hole as possible. The electrical connection to the mud plugs (where the wire connects to the mud plug) must be sealed and protected from moisture. During initial manufacture the handle portion of the mud plug is covered with heat shrink tubing with a meltable inner liner that forms a waterproof seal around the connection. If this becomes nicked or cut, use electrical tape as necessary to restore and maintain a waterproof seal.



Figure 2-2: Mud Plugs in Use

## Section 3: System Operation

### Logging a Borehole

Although each logging site is different, below is a typical sequence of events to set up and log a borehole.

- Place the winch on a dry area at a convenient distance from the borehole. You should be at least 5 meters from the borehole.
- Set up the tripod over the borehole.
- Connect the winch to a suitable source of 12-14VDC power.
- Turn the control box POWER switch and EPCI POWER switches to ON.
- Set the direction switch to DOWN, turn the SPEED knob fully clockwise, make sure the brake is off (handle vertical) and pull out enough cable to reach the borehole plus a meter or two extra.
- Set the brake and rotate the SPEED control fully counter clockwise.
- Remove the probe top and cablehead protector caps.
- Connect the cablehead to the probe.
- If the probe includes electric logs, tape over any exposed metal on the cablehead and probe top and bury the surface electrodes (see Appendix A for details).
- Turn the EPCI's PROBE switch to CONNECT and, after a few seconds, observe the connected probes model and serial number in the display.
- Lower the probe into the borehole. Rotate the tripod as necessary to make sure the cable runs straight and true over the tripods sheave wheel. Rotate the cable wiper out of the way as it is not necessary on the trip into the borehole.
- With the brake set, switch the direction switch to UP and turn the SPEED control clockwise to slowly bring the cablehead/probe top junction up so it is even with ground level.
- In DELogger, preset your *acquisition depth* to zero. Probe sensor depth offsets are automatically taken care of during data acquisition.
- Release the brake, switch to DOWN and rotate the SPEED control to lower the probe to the bottom of the hole.
- When you reach the bottom of the hole:
  - Set the brake (lever approximately horizontal).
  - Enter the depth of the probe in the box labeled Acquisition Depth in DELogger.
  - Click the X next to the box to set the depth in DELogger.
  - Turn SPEED fully counter clockwise.
  - Switch to UP.
  - Rotate SPEED to slowly spool cable in and take any slack out of the cable.
  - Rotate the cable wiper on the tripod so it will wipe the cable as it comes out of the borehole.
- Click on LOG in DELogger and notice the status line (lower left hand corner of the screen) change from "idle" (or "status") to "logging."
- Turn SPEED to come up the borehole at the desired logging speed. If acquiring data at 10cm intervals, 5-7m/min is a good logging speed. Finer acquisition intervals may require slowing your logging speed down. If the logging speed is too fast you will get "Logging too fast" error message from DELogger (indicating a data interval may have been lost).
- While logging up, keep an eye on the DEPTH. When it nears zero you will want to slow the winch and prepare to stop it when the cablehead/probe top are level with the ground (as it was when you started logging).

- Click on SBY in DELogger to stop acquiring data.
- Edit the log's header and, when finished, click on *File/Save* (or the disk icon) to save your file. You may edit the log's header at any time.
- When you are finished logging, turn the PROBE switch to OFF and you can safely disconnect the probe.
- Install the protector caps on the probe and cablehead.
- Wipe excess mud/water from the cable while spooling it into the winch.
- Store the cablehead in the storage tube provided.
- Turn all POWER switches OFF and store everything in its storage containers.

## Take Down

When finished logging or when the system is not in use always keep the probe top and cablehead protector caps in place to keep the connectors, O-rings, O-ring glands, and threads free from dirt. Keep the O-rings and mating surfaces and the probe top and cablehead retaining nut threads free from dirt and grit. When clean, apply a thin film of O-ring grease to each surface. Wipe the probe down before storing it in its protective case. Keep the winch covered and all probes and cables protected from the elements.

Refer to Appendix A for special considerations when using Electric logging probes or battery powered probes (such as GE9409/GN9506).

## DELogger Log Acquisition Software

### Overview

DELogger is a program used for simple data acquisition from Delta Epsilon logging hardware using a laptop or other personal computer. It requires a system operating with Windows 95, 98, XP, Windows NT, or Windows 7. DELogger can collect a set of logs from the logging system, write it to a disk file, print it to any Windows installed printer, and play back previously recorded logs.



**NOTE:** Selecting Plot without a dedicated Delta Epsilon Plotter attached will cause the program to crash. DELogger must then be closed and restarted.

Operation of DELogger is based on a chosen set of logs called a log configuration herein. First, you choose a log configuration. Then, DELogger tries to access the proper logging tool or load matching data from a file. Data must be available for every log that is in the chosen log configuration, but it is not necessary to include, in the chosen configuration, every log that is available from the logging tool or from the file. Any number of log configurations may be created and saved. A particular configuration is chosen by selection from a list and facilities are included to maintain the list.

The properties of each log may be chosen while setting a configuration. You may choose which to display: a log, its color, whether it is filled, and whether it is filtered. Once a log configuration is chosen, that set of logs is displayed on the screen. You may choose and change the depth scale, the bias and span for each log, and the range of depths currently displayed. Keyboard shortcuts are included to make these adjustments possible by either use of the mouse or use of keystrokes. At any time, the scales currently displayed may be saved manually. These scale settings become the default settings for the currently chosen log configuration.

At any time, all of the data for the chosen log configuration is retained in your computer's memory much like a document in a word processor. You may stop logging, and then continue logging or you may re-run parts of the hole to overwrite data already collected. The data currently in memory may be saved to a file that is written in a standard LAS v2.0 format. The current data may be completely deleted at any time to clear the data set for a new log. A previously saved log may be re-loaded into memory from its LAS file.

Data is collected from the hardware through your computer's serial port. A commercially available RS-232 to USB converter may be used to connect to PC's that have no RS-232 (COM) port. Data acquisition is initiated by clicking the Log button. At this time, the program checks that communications with the logging tool are possible. Acquisition of logging may be suspended or stopped by clicking the SBY button. Acquisition may be resumed by again clicking the Log button.

Header data is saved in the LAS file with the log data. Header data may be entered at any time: before, during, or after logging. The currently entered header data becomes the initial header data for the next log to minimize re-entry of header information. Header topics may be added or deleted.

## **Quick Tour of DELogger**

### **Set up Log Display Parameters**

- From the menu, Choose Edit and Log Configuration.
- Click the down-arrow in the Drop Down box and click Four Logs.
- Click OK. Note the logs that will be displayed and their colors.
- From the menu, choose Edit and Log Configuration again.
- Click the box for NGAM and Color. Enter the number 5.
- Click OK. Note that the color of the Gamma trace has changed.

### **Set up Logging Parameters**

- From the menu, Choose Edit and Log Configuration.
- Click the tab labeled Logging Parameters.
- Click the small arrows to increase or decrease the data interval.
- Alternately, enter your own data interval.
- Click OK.

### **Set up the Header Information**

- From the menu, Choose Edit and Header.
- In the column labeled Entry, enter information of your own choice.
- Add an entry in the header
- Click the bottom line of the grid, next to the small star.
- Enter information of your choice. The Description is the text that will be printed to identify your data. The LAS column is a mnemonic that will identify this data in the LAS file. See Saving Currently Displayed Data.
- Delete an entry in the header
- Click any box in the row to be deleted.
- Click Delete.
- Click Close.

### **Connect and check the Logging Probe**

- Connect the logging probe to the winch and the USB cable to the computer.

- Click Hardware and Check Hardware.
- If the hardware and the software are correct, a box will be displayed that shows the hardware model numbers and serial numbers.
- If the hardware is not operational, or the wrong probe is connected, an appropriate message will be displayed.
- Collect some data
- Run the winch and align the top of the probe with the top of the hole (which is zero depth) or with some other known depth reference. The reference point on the probe is the top of the probe.
- Double click the box labeled Acquisition Depth and enter the reference depth.
- Click the X next to the box to set the reference depth into the computer and into the winch.
- Run the winch to the bottom of the hole or to a point at which you want to begin logging.
- Click LOG.
- Run the winch at the chosen logging speed. Note the data being collected. At any time, scales may be adjusted. See the next step.

### **Adjust the scales and the display**

Click the box at the top of the log. A box showing span and bias will appear. Adjust span and bias by clicking the arrow or by double clicking the text box and entering values. Experimentation allows you to set any span and bias to display the log as you wish.



**NOTE:** The display settings do not affect the data that is recorded for the log. The recorded data is in absolute units.

### **Save the currently displayed scales**

From the menu, click Edit and Save Scales. The currently displayed scales will be the scale settings the next time you start DELogger.

### **Adjust the length of the log displayed.**

Click the down arrow in the box showing ft/in or m/cm. Select a scale. The scale of the log will be adjusted.

### **View a different part of the log.**

Click or drag the scroll bar at the right side of the log to view data above or below that being displayed. While you are logging, DELogger will try to keep any recently collected data in view so the scroll bars may move back where they were.

### **Save the currently displayed log in an LAS file**

- From the *File* menu, select *Save As*.
- Select the folder to save the file.
- Enter a file name and click *Save*. The “.LAS” extension is added automatically.

### **View a log previously saved**

- From the menu, click Edit and Clear.
- From the menu, click File and Load.
- Enter a directory and a file name.
- Click Open.

- The LAS file will be displayed.

### **Print a log that is displayed**

From the menu, click File and Print. Choose your printer and set it up as usual. The log will be printed on your printer.

### **Adjusting scales**

- Log scales are adjusted by clicking the scale box at the top of the corresponding log. A scale-adjustment box drops down and displays buttons and text boxes in which you may adjust both bias and span. The buttons adjust the scale values in a direction to move the log curve in the direction of the button. The boxes allow you to enter a specific scale if you so choose. To close a scale adjustment box click anywhere on the logs or press the escape key.
- The scales may be operated from the keyboard as well as with using the mouse. The tab key cycles through each of the scale-adjustment boxes and then to the depth scroll bar. When a scale adjustment box is shown, the bias may be adjusted using the left and right arrow and the span may be adjusted using the up and down arrows.
- The depth shown in the display is adjusted by clicking and/or dragging the scroll bar at the right of the screen. A click of the small arrows at the top of the bar adjusts the depth displayed upward or downward by one division. A click between the arrow and the scroll-bar button adjusts the depth displayed upward or downward by on full screen. Dragging the button from top to bottom scrolls the log from top to bottom. When the scroll bar has the focus, indicated by its flashing, then depth shown in the display may also be adjusted by using the up, down, page-up, and page-down arrow keys.
- The range of displayed depths is adjusted by selecting the depth scale (ft./in.) on the toolbar. You may adjust the depth scale to some large value, say 50 ft/inch to display the entire log. Then you may adjust the depth scale to some normal value, say 10 ft/inch to display detail.

### **Checking the Hardware**

- On the menu, select Hardware/Check Hardware.
- If no communications to the EPCI can be established a message will be displayed.
- If communications to the EPCI can be established but no probe is connected or the probe is not working properly, a message will be displayed.
- If communications are established and a probe is connected, a box will be displayed showing model numbers, serial numbers, and software versions.

### **Choosing a Log Configuration**

A log configuration is a particular choice of logs and a particular assignment of plotting parameters for each log. You may choose:

- the API grid that each log will be plotted upon
- the color displayed for each log
- whether or not the area under the log curve is filled
- whether or not the log is filtered
- Each log is given a name. For example, NGAM is the natural gamma-ray log; SPR is the single point resistance. The names of all available are displayed when a 'new' display configuration is chosen.



**NOTE:** If you have a calibrated gamma probe, you can add an Assay trace which calculates  $\gamma_{308}$  from the gamma curve. Choose ASSY from the pull down menu of log names. Scroll to the far right to enter your probes k factor.

- To choose, create, or edit a display configuration, choose Log Configuration from the Edit menu or click the related toolbar button.
- To change to another configuration, click the drop-down list box and click the chosen configuration from the list.
- To delete an entire configuration, click the Delete button next to the drop-down list box.
- To create a new configuration, click the new button next to the drop-down list box. Edit the text to describe this configuration. Then add logs as below.
- To delete a log from a configuration, click the log ID in the grid and then click the Delete button below the grid.
- To add a log click the add button below the grid. Then choose the log you want to add from the pop-up list box. Then choose the grid, color, initial span and bias values, and the Fill and Filtered options. You may change the descriptive title for a log.



**CAUTION:** Choosing a new configuration erases any log data currently in memory. Therefore, you should not change the log configuration before current data have been saved and you should use care to assure that a new 'blank' file is not saved to the file name as an existing file.

### Clearing the screen

All of the logs shown may be cleared by selecting Clear from the Edit menu or by clicking the corresponding tool. Clearing deletes all of the log data in memory.

### Copying to the clipboard

A copy of the logs as they are displayed on your screen may be copied to the clipboard and pasted into another application such as a word processor. To copy to the clipboard, select Copy from the Edit menu.

### Loading previously saved data

- To load data from a LAS file, first choose a log configuration that is compatible with that file. The Log ID's that are selected in the log configuration must be present in the LAS file. Not all of the logs in the LAS file need to be loaded. DELogger will load only the data for each log chosen for display with the log configuration.
- To load data, choose -Load from the File menu or click the associated toolbar button. Follow usual Windows 95 director and file selection procedures to locate the desired file.

### Entering information into the header

Header information is retained in a permanent file. The saved data is always the last header used. Header information may be added, deleted, or edited. The header information shows a Description, an Entry, and an Abbreviation. The Description is the caption that is plotted in headers. The Entry is the header data. The Abbreviation is the

abbreviation used for LAS files. If you want your files to conform to the LAS standard so that they can be read by other applications, then use care in adding or deleting the Abbreviation.

### **Operating the caliper arms**

- On the menu, select Hardware/Open and Close Caliper arms.
- Click Open to open the arms and Close to close the arms.
- Wait until the status box indicates that the arms are opened or closed.

### **Printing to your printer**

The existing log may be printed to your windows printer by selecting Page Setup and Print from the File menu. When printed, the header is printed at the top of the log, then the log is printed as it is shown on your screen. One complete page is printed on your printer even if not all of the data are displayed on your screen.

### **Saving currently displayed data**

- Data are saved and retrieved by DELogger in a file that is formatted according to the LAS version 2.0 format specified by the Canadian Well Logging Society. This file contains the log header data, other information, and the logging data.
- Data may be saved at any time during or after logging. It is not required that files carry any particular file-type-extension but it is recommended that the LAS extension be used.
- Data that has been previously saved in a LAS file may be loaded from that file back into DELogger. Additional data may then be collected. Then when the data are saved, all of the data will be saved. This provides a convenient way to make a complete log of a log, which was previously partially collected. When, during logging, data are collected at depths for which data is already present, the old data is overwritten. If the probe is run up and down the hole, then new data will overwrite old data.

## Section 4: System Maintenance

Maintenance on the 3A-300 winch consists of keeping it clean and dry. The 3A-300 Winch was designed to be weather/water resistant, however to insure a long, trouble free operating life, you should make every effort to keep it clean, dry, and protected from the elements. The use of a high-pressure spray - such as found in a car wash - is NOT recommended. Use moist cloths to wipe the unit down and remove contaminates. Use of a cable wiper (as found on Delta Epsilon tripods) will help remove most of the drilling mud and water before it reaches the winch and its case.

### Re-heading Instructions for GOI-4 Cablehead

The following tools and hardware will be necessary to re-head the cable:

- GOI-4/1-H-100 re-heading kit (see below).
- Heavy duty cable cutter for 0.10" steel armor logging cable.
- 1/8" hex wrench.
- 4" Clamp or medium sized locking pliers.
- Electrical wire cutters.
- Electrical wire strippers.
- Soldering iron (35W-75W) and rosin core solder.
- Ohmmeter capable of measuring >100M $\Omega$  as well as zero to 100 $\Omega$ .
- Medium sized vise with smooth jaws (two pieces of soft wood may be used to protect the cable).
- Waterproof (marine) grease.

The following items are included in the re-heading kit available from Geotech.

- 4" (10cm) of #24AWG Black wire.
- 4" (10cm) of #24AWG Orange wire.
- One 1/4-28 Grease fitting.
- One 1/4-28x1/4" SS Set screw.
- One strain relief cone (#GOI-0x100-CONE).
- One strain relief sleeve (#GOI-0x100-SLEEVE).
- One connector Insert boot (#GOI-4-BOOT).
- Four 2-014 O-rings (two for the cablehead plus two spares).
- Two 2-013 O-rings (one for the CONNECTOR INSERT plus one spare).
- One roll Scotch 88 electrical tape.
- One tube O-ring grease (Suberlube).
- 6" x  $\varnothing$ .75 adhesive lined heat shrink tubing.
- 6" x  $\varnothing$ 1.0 adhesive lined heat shrink tubing.
- 4" x  $\varnothing$ 1.5 adhesive lined heat shrink tubing.

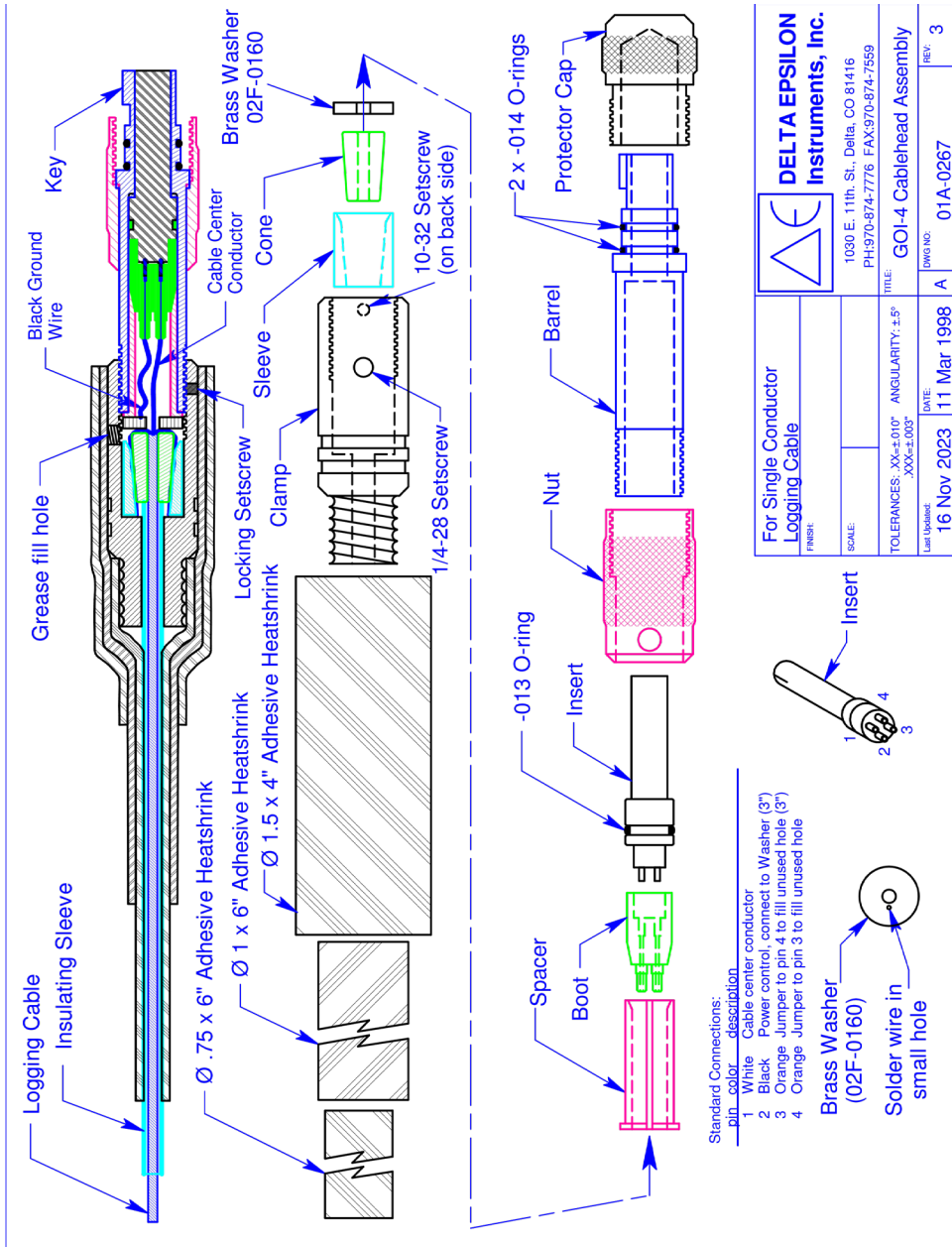


Figure 4-1

## Dismantling the Cablehead

1. During the re-heading process, you will want to remove any kinked or damaged sections of cable. Unspool all cable with INSULATING SLEEVING and any that is damaged or badly kinked. Unspool an additional seven meters (20') or so to give you room to work. Remove any electrical tape from the cablehead assembly. Slide the INSULATING SLEEVING away from the cablehead (towards the winch) past any kinked or damaged sections of cable. Leave at least two meters (6') of good bare cable exposed.
2. The inside of the cablehead is full of grease so do this step over paper or cloth rags that can be thrown away. Unscrew the BARREL and slide the CLAMP back up the LOGGING CABLE to expose the SLEEVE, CONE, WASHER, SPACER, BOOT, and INSERT. Then push on the INSERT (use a blunt object on the end opposite the wires) and force it out of the BARREL. Cut the LOGGING CABLE about two cm (1") from the end of the BOOT. Remove and clean the grease off these parts, taking care not to damage any of the remaining wires.
3. Dismantle the CONE and SLEEVE strain relief. It may be necessary to support the SLEEVE (from the cablehead end) and drive the CONE out of the SLEEVE.
4. Cut off any damaged sections of cable. Inspect the INSULATING SLEEVING and replace it if necessary. To run electrical measurements, such as Resistivity or Spontaneous Potential, you need a minimum of 7.5 meters (25') of INSULATING SLEEVING. Make sure to cut the cable cleanly and squarely. A sharp chisel can be used if a cable cutter is not available. Leave at least 2 meters (6') of bare cable (extending past the end of the INSULATING SLEEVING) with which to work.

## Heading the Cable

1. Make sure the following parts are on the cable in the order given, starting from the winch end of the cable:
  - a) Minimum of 7.5 M (25') of INSULATING SLEEVING.
  - b) CLAMP with internal threads towards probe
  - c) SLEEVE with small diameter opening tow

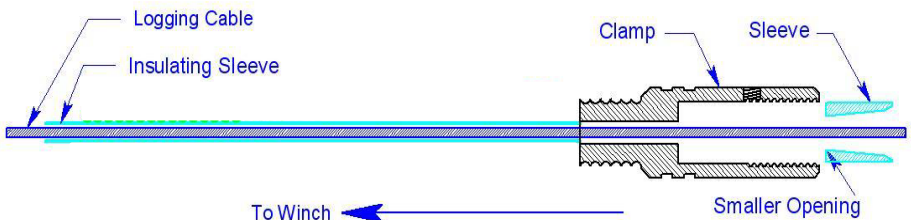


Figure 4-2

2. Slide the INSULATING SLEEVING, CLAMP, and SLEEVE up the cable (out of the way) a couple of meters (6'). Tightly wrap several (6-8) wraps of electrical tape around the cable about 20cm (8") down from the cut end of the cable. The tape helps keep the cable from slipping during re-heading.

3. Very gently clamp the cable in a vise. Position the top of the tape even with the top of the vise. The cable is easy to damage so use as little pressure as possible.
4. Slip the CONE onto cable, small end first, down onto the cable.
5. Carefully unwrap each strand of the outer layer of armor. Straighten the 3-4cm (1.5-2") nearest the top of the CONE and fold the strands down over the CONE. This helps when feeding the strands between the CONE and SLEEVE.

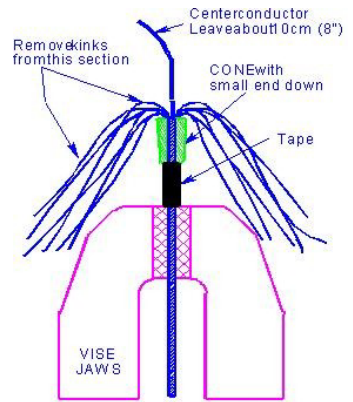


Figure 4-3

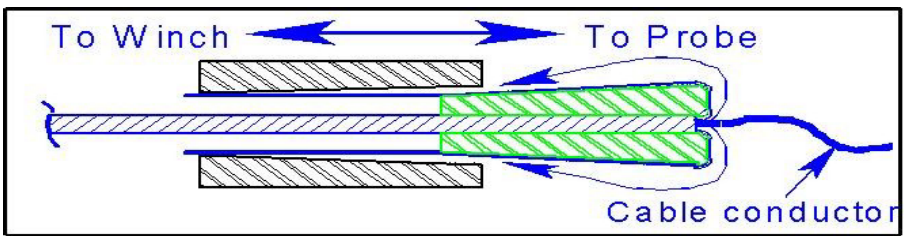


Figure 4-4

6. Now, do the same with each strand in the inner layer, feeding the strands between the strands of the outer layer. Take care not to nick or kink the cable wire.
7. Take the cable out of the vise and fold the strands down over the CONE. While holding the ends of the strands, slip the SLEEVE up over the strands and as far over the CONE as possible. The strands thus become clamped between the CONE and SLEEVE. Keep the strands straight, making sure no strands cross over one another.
8. Clamp the cable very loosely at the bottom of the SLEEVE (cable wire pointing up). Allow the strands to extend through the vise. Grip all the strands and the cable and pull down firmly, seating the CONE into the SLEEVE.
9. Pull evenly on each strand to work the CONE down into the SLEEVE. Make sure there are no loops on the top of the CONE as they can dig into the cable wire and short it to armor when the head is fully assembled. Pull on each strand individually, working around the CONE until 3mm (0.1"), or less, of the CONE remains outside the SLEEVE. It is very important the strands not cross over one another and no loops remain above the CONE.

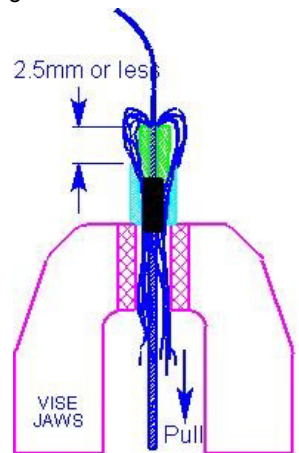


Figure 4-5

10. Remove the cable from the vise and trim the strands as close as possible to the bottom end of the SLEEVE (end nearest the winch). Remove the electrical tape.

## Making the Electrical Connections

1. Slide the BOOT off the CONNECTOR INSERT and clean any grease from the electrical contacts. Unsolder and discard the old piece of cable wire. If the jumper wire (connecting INSERT pin 3 to 4) or the wire between INSERT pin 2 and the WASHER are nicked or otherwise damaged they must be replaced. Inspect the BOOT and replace it if it is nicked, cracked, or cut. Apply a small amount of grease onto the wires to help them slide through the BOOT. Take care not to cross any wires between the INSERT pins and their matching holes in the BOOT.
2. Inspect the wire going from the WASHER to pin two (2) of the INSERT. Replace the wire if it is abraded or cut. Repair the connection if it is bad. Install the WASHER over the CABLE center conductor. Make sure the wire exits on the side that faces the probe.
3. Cut the new CABLE center conductor, leaving 10cm (4") free. Feed it through the BOOT, strip about 0.6cm (.25") of insulation from the free end, and solder it into pin 1 of the INSERT.
4. Inspect the jumper wire going from INSERT pin 3 to pin 4. Replace the wire if it is abraded or cut. Repair its connections if they are bad.
5. Apply a small amount of grease to the inside of the BOOT and, while keeping moderate tension on the wires to the wires, slide the BOOT onto the INSERT until it snaps into place. Keep the wires straight. A kinked wire could cause a bad seal. Proper sealing depends on there not being any voids inside the boot.
6. Install a new O-ring on the CONNECTOR INSERT (#013) and apply a small amount of grease to the O-ring and inside the threaded end of the BARREL. Slip the SPACER over the wires and use it to push the BOOT/INSERT assembly into the BARREL until the mating end is flush with the end of the BARREL. Align INSERT pin 1 (the one the CABLE connects to) with the key on the BARREL. Also, make sure no wires become pinched between the BARREL, SPACER, or BOOT/INSERT.
7. Slide the CLAMP up over the CONE and SLEEVE, SPACER, BOOT and INSERT assembly. Turn the BARREL counter-clockwise two turns to pre-twist the wires. Then screw the BARREL assembly clockwise into the CLAMP. Make sure no wires become pinched between the SPACER, WASHER, BARREL, or CLAMP. Tighten the BARREL by hand and then use the pliers to snug it up (up to additional ¼ turn). Confirm that pin 1 of the INSERT is still aligned with the key on the BARREL.



**NOTE:** Check the CLAMP periodically (once per month) to make sure it has not come loose. The cable should be reheated at least every six months. More often if you are logging in corrosive borehole fluids.

8. Disconnect the Winch to EPCI Depth/Speed display cable from the winch and perform the following tests:

- a. Measure >100MΩ between the INSERT pin one (1) (or pin G of the plug) and cable armor.



**NOTE:** If your ohmmeter does not have a 100MΩ range but has a conductance (1/ohms) range, a reading of less than 10nS is OK.

- b. Measure approximately 25Ω per 300m (1000') of cable, between the INSERT pin 1 and pin G of connector J3.



**NOTE:** If the cable does not pass both of these tests, you must cut the cable and start over!

### Injecting Grease and Reassembly

1. Slide the INSULATING SLEEVING up against the CLAMP.
2. Remove the SETSCREW and replace it with a GREASE FITTING. Use a grease gun filled with waterproof grease (such as marine trailer grease) to fill the cavity inside the CLAMP and BARREL. Grease will exit the small hole in the BARREL when it is full. Inject a bit more grease to make sure the entire cavity is full of grease. The grease will protect the connections and strain relief parts. Replace the GREASE FITTING with the stainless steel ¼-28 SS SETSCREW. Tighten only until snug. Do not over tighten the SETSCREW.
3. Wipe excess grease from the end of the CLAMP. Use a “half-wrap” method (current wrap overlaps ½ of the previous wrap) to cover the CLAMP and at least 5cm (2”) of INSULATING SLEEVING with high quality (Scotch 88) electrical tape. Apply two, or more, layers.
4. Re-check the resistance measurements between the cable center conductor and cable armor (described in the previous section). If all tests pass, replace the O-rings (two each 2-114) on the cablehead. Apply a small amount of O-ring grease to the O-rings and carefully slip them into their glands. Take care not to stretch the O-rings as you are installing them.
5. Reconnect the Winch to EPCI Depth/Speed display cable and test the system. Open the DELogger program on your PC and click on “*Hardware/Check hardware*” to see that the program can communicate with the attached probe. The probes model and serial numbers will be displayed.
6. Put the PROTECTOR CAPS back on the cablehead and probe when you are finished.



**Figure 4-6:** Typical finished assembly

## Section 5: System Troubleshooting

**Problem:** You are getting frequent messages “Serial Communications Error” while logging.

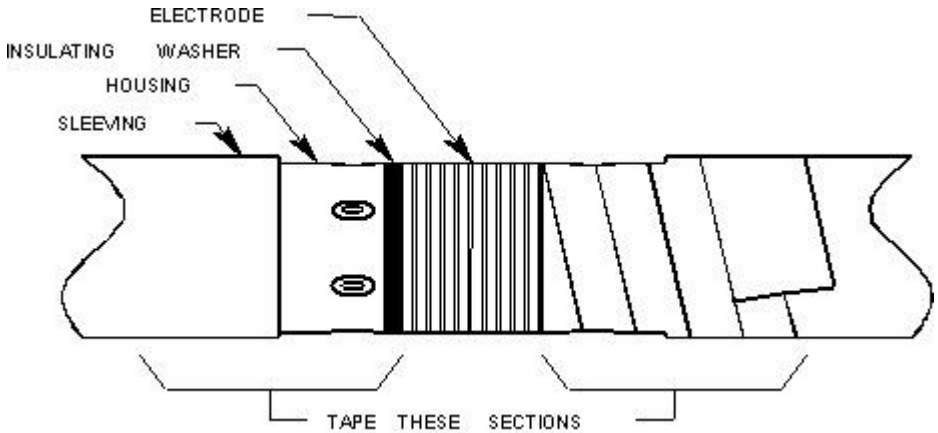
**Solution:** It is possible that your computer is busy working on other tasks besides DELogger. Check your Startup group (see Windows Help) and remove any programs that are being automatically started when you boot up.

## Section 6: Parts and Accessories

Qty	Part Number	Description
Kit	52251016	GOI-4/1-H-100 REHEADING KIT
4"	PPE001025010	WIRE, 24AWG, BLACK, .010 PVC
4"	17500241	WIRE, 24AWG, ORANGE, STR, .010" PVC
1	12251304	ADAPTER, ZERK, SS3, ¼"-28 MALE
1	12251305	SET SCREW, SS8, ¼"-28 x ¼"
1	22251084	GOI-4 CABLEHEAD STRAIN RELIEF CONE
1	22251082	GOI-4 CABLEHEAD STRAIN RELIEF SLEEVE
1	12251084	BOOT, BLK, 4PIN
4	12251891	O-RING, BUNA, -014
2	12251890	O-RING, BUNA, -013
1	12251084	TAPE, SCOTCH 88 ELECTRICAL, 66'
1	12251303	GREASE, SILICONE, 3OZ
6"	12251171	HEATSHRINK TUBING ¾"
6"	12251065	HEATSHRINK TUBING 1"
4"	12251244	HEATSHRINK TUBING 1 ½"

## Appendix A

When using a probe with electric logs (resistivities, spontaneous potential, etc.) all exposed cablehead/probe top surfaces must be insulated from the borehole fluid by wrapping them with high quality electrical tape.



Also keep any exposed probe housing around the electrodes insulated, but do not cover any of the electrodes with electrical tape. Apply tape from the edge of the insulating washer to the neoprene sleeving. Cover at least 1" (2-3cm) of the neoprene sleeving. Overlap each wrap by at least half with the next new wrap.

### Charging Batteries in Battery Powered Probes

The GE9409 Gamma Electric probe (GN9506 with a Long Normal adapter installed) is the only Delta Epsilon probe with internal batteries. The batteries will supply up to 100 hours of operation and will normally recharge in three hours. To charge the probe batteries, connect the AC Adapter to the Probe Battery Charge Adapter. The battery charge adapter is then plugged into the probe. Plug the AC Adapter into a power source 100VAC - 240VAC 0.7A @ 50/60Hz. Charging will take approximately three hours. The batteries are protected from overcharge and can be left on charge indefinitely with no damage.

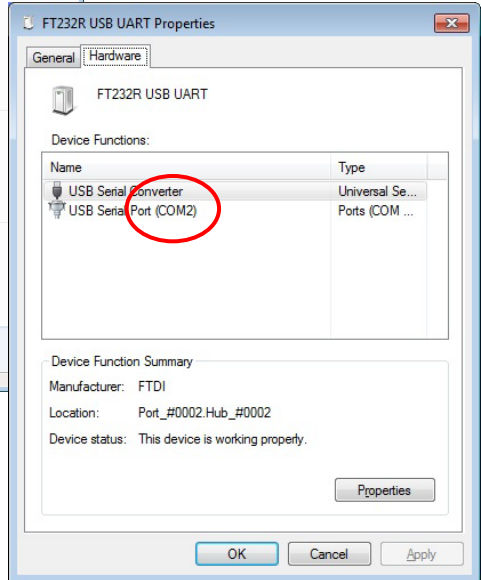
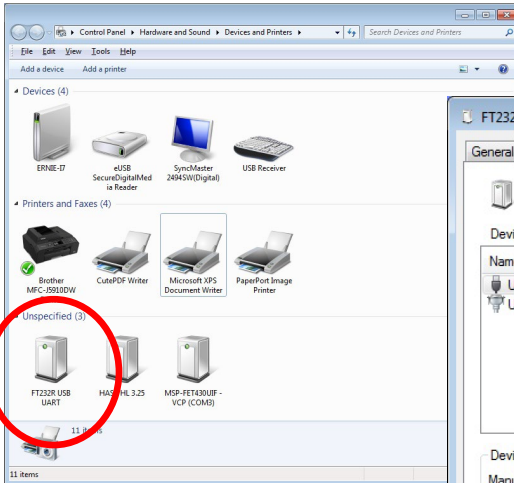


**NOTE:** To prevent degradation or damage, the GE9409's batteries should be charged at least once every six months.

## Appendix B

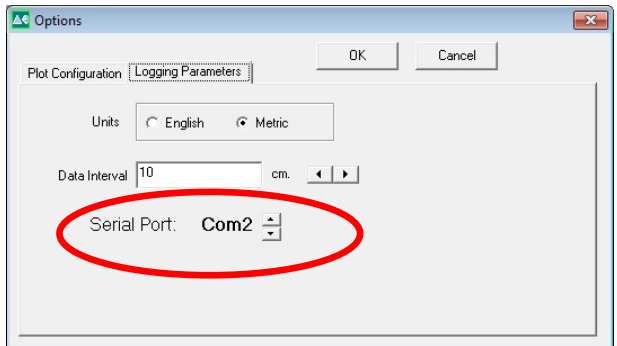
### Setting Up Your USB Port

Note, the winch must be turned ON and its USB cable plugged into your PC before launching DELogger. This is to allow Windows to recognize the USB connection, open and assign a COM port to it. In addition the Serial Port in DELogger must be set to match the COM port Windows assigned to your logger. Open Devices and Printers (as shown below) and double-click on the FT232R USB UART icon.



This will open the FT232R USB UART properties window. Click on the *Hardware* tab to see which port Windows has assigned to your logger (COM port 2 in this example).

DELogger's *Serial Port* number must be set to match the Windows COM port. In DELogger select *Edit/Log Configuration* and then the *Logging Parameters* tab. Use the up/down arrows to set the matching COM port number and click OK.



## Revision History

<b>Project #</b>	<b>Description</b>	<b>Date</b>
2225	Created Manual – AH & GR	12/4/2023
2578	Revision to System Operation Instructions – AH	04/29/2026

## NOTES

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## NOTES

## The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

## Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call our 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION, PLEASE CALL OUR  
SERVICE DEPARTMENT AT 1-800-833-7958.

Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Date of Purchase: \_\_\_\_\_

## Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used. Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate the equipment for a fee, which will be applied to the repair order invoice.

**Geotech Environmental Equipment, Inc.**

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