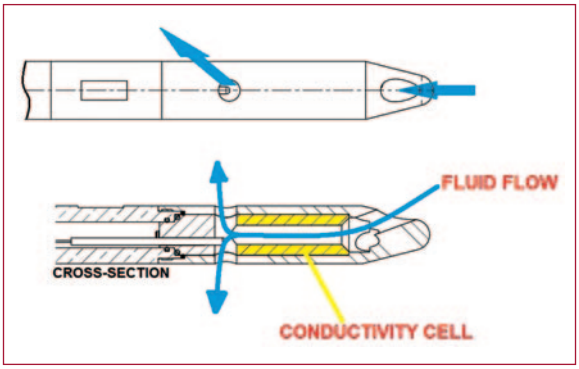
Getting the best from your Robertson Geo Temperature Conductivity probe

A fundamental measuring instrument for water studies, the Temperature Conductivity probe gives a real insight into the primary characteristics of borehole fluids. Fluid temperature profiles are becoming increasingly important in geothermal studies, and have always been a crucial indicator for inflow zones, as well as being able to temperature compensate other logs. A straightforward fluid conductivity measurement can speak volumes about aquatic environment, even without any ion-specific interpretation.

The combination of these two measurements in a probe, especially in conjunction with an optional natural Gamma sensor for correlation, represents a timeless classic used by many industries.

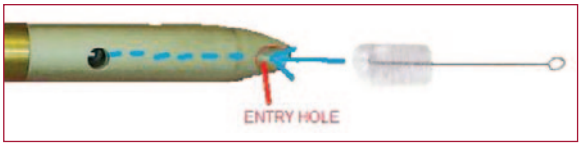
Utilising a PT1000 temperature sensor mounted in a 'flow-through' gallery within the tip of the probe, the Robertson Geo Temperature Conductivity instrument offers one of the most reliable and sensitive temperature responses in its class.



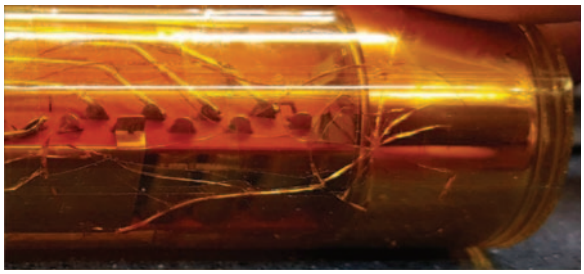
The small electrical resistance changes presented by the sensor are amplified by a stable electronic bridge circuit before being digitized for transmission to the surface. Before reaching the sensor, the fluid passes through a conduit containing three Graphite electrodes (Conductivity cell), which allow measurement of the fluid conductivity in a 'guarded' fashion to screen out any external influences. The current flow between the electrodes is amplified electronically, and the proportionate value of conductivity is again digitized for streaming with the other data.

The number one enemy of the Temperature Conductivity probe is contamination of the fluid gallery. While the size of the gallery is sufficiently large to allow most larger contaminants and particles to pass harmlessly through, you should be vigilant and inspect that there are no blockages or foreign bodies adhering to the sensors after every use. Rinsing the probe with clean water is very good practice after logging, and before packing the gear for transit.

Be aware that the surface meniscus of the borehole fluid is the area where contamination is most likely to occur during a log. Floating vegetation, algae, or oils are common, and can pose problems, especially for the inner surface of the conductivity cell. We have seen many instances where a client has noted that their conductivity measurement suddenly seems 'off', and cleaning the cell has provided an instant remedy. The cell had become coated internally with a contaminant, covering the Graphite electrodes and interfering with the flow of current. The cell may easily be cleaned using a 'bottle-brush' with water and a mild detergent, as illustrated below.



Most operators should be aware of the aspect of stirring up the borehole fluid with any initial logging activity. It is important to consider that the Temperature Conductivity downlog should be performed first in order to capture an undisturbed profile. Downhole is also the best direction to maximise the flow-through of fluid, and therefore response, with this probe.



The probe does not require centralization, however, in inclined holes there is a risk of running the probe in a layer of collected sediments. Some form of stand-off might prove to be helpful in these conditions.

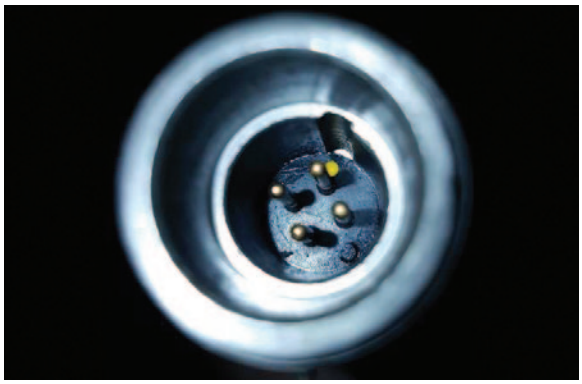
Whilst ensuring that the visible sensors of this type of probe receive the attention they deserve, we must also consider the other important aspects of such a measuring instrument. The optional Natural Gamma sensor consists of a scintillation crystal, optically coupled to a glass photomultiplier tube. It is possible to fracture both of these parts by subjecting the probe to extremes of physical shock, such as dropping the probe onto hard surfaces, or knocking against steelwork etc. If you notice that there are zero background Gamma counts showing from the probe when energized, or that the milliamp current demand shown by the software is much greater than normal, then mechanical damage is a distinct possibility, an example of which can be seen below.

The other crucial aspect of any borehole probe is the connection to the surface. The connector at the top of the probe can cause a number of operational problems if not properly looked after.

This connection provides electrical contacts to the probe, a high pressure seal to protect those connections, and also the mechanical coupling to suspend the probe in the borehole. The important role of this part cannot be understated, and it is surprising how may operators do not fully appreciate the implications of poor maintenance here.

The cable-head which connects to the probe features O-Ring seals, and it is imperative that these are kept scrupulously clean and lightly greased with silicone compound every time it is used.

The aperture at the top of the probe which has four visible connection pins should be kept clean, and should be regularly inspected for signs of water ingress, blackening or corrosion of the pins, or dirt. The pins themselves should be a shiny metallic gold colour - anything else, and problems are already beginning.



The area can be cleaned out with distilled water and then isopropyl alcohol if necessary, but should be allowed to thoroughly dry out before use (At least five hours open to the air).

Do not leave maintenance until you observe communication problems, zero or short-circuit current in the software display, or the bane of any operators life, intermittent problems!