TROUBLESHOOTING AND MAINTAINING ROBERTSON GEO LOGGING EQUIPMENT

Even with the best will in the world, and a peerless maintenance schedule, problems can occur out in the field once you are on a geophysical logging job.

You have assembled the kit as you normally do, the winch and probe are all rigged up ready to go, but something is not right. The software refuses to work, or no data comes from the probe, or the winch is doing something odd.

What can you do before having to abandon the job?

SOFTWARE

Always, always check that your equipment is working before leaving base. A logging computer is an essential part of the system, and problems generally only arise for the following reasons:

1. **The dreaded operating system updates -** Computers have an annoying habit of updating their operating systems at the most inopportune moment, and there is a history of this causing compatibility problems which no one can foresee. We strongly advise that a logging computer be dedicated to the logging task only. Connecting this computer to the internet carries the risk of allowing an operating system update. If you have checked that all is well after such an update, then there is a low risk of falling foul of this one.

2. **Background software -** As we mentioned, using the logging computer for the sole purpose of running geophysical surveys is the single most important thing you can do to guarantee your continuity of service.

   Watching videos while waiting for data to gather, or having virus checkers, screen savers, or other background software running is, quite frankly, asking for trouble.

3. **Power supply -** on many occasions users have encountered random problems which have all been traced to the use of inexpensive mains power inverters. We always recommend users who have no access to local mains supply should consider using a properly regulated generator, first and foremost. If using an inverter to create a mains supply from a vehicle battery, this must be of the 'True-Sinewave' type. In extreme cases with inferior inverters, the USB link from logger to computer can experience significant data errors, which can slow down or completely interfere with the smooth running of the logging software. Running a laptop PC from it's own internal battery is the best option if the battery life is suitable.

4. **USB cables -** If your system comprises a computer which is not physically fixed into position, and is packed and unpacked during the course of a job, you will need to pay particular attention to the condition of USB cables. Some systems will use just a Micrologger, which links to the computer via a single USB lead. Others may feature an extra interface with its own lead. In both cases, take great care of these leads.

   Having them in a position where they can be tripped over, stood on, run over by heavy equipment, etc, will inevitably damage the plug or conductors, and could even lead to expensive damage to the computer itself.

   The software will not run fully or correctly if the lead is unplugged or damaged, so check this straight off.

PROBE FUNCTION

This is the business end of the system, and although the variety of probes available is too wide to individually cover here, there are common problem areas:

1. **Handling -** A probe is designed to withstand extreme pressure and temperatures, however, some of the instrumentation inside is necessarily vulnerable to impact damage.

   A probe is not a drill-pipe, and this can be easily forgotten by operators not accustomed to them.

   Dropping a probe onto a hard surface, or turning quickly and bashing it into stanchions, buildings, or vehicles can get expensive very quickly.

2. **Cable-head/probe junction -** Sadly, the importance of this humble feature of a logging system is widely misjudged. Not all operators are aware that a cable-head should actually be stripped down and remade at intervals to prevent connection failure, or even potential loss of a probe.

   There is no hard-and-fast rule on this, however, annual maintenance of a heavily used system should be considered a bare minimum.

   When hooking up or removing a probe from the end of the winch, consider the environment where this is taking place. Dirt, dust, and grit are usually present at any borehole site. The electrical connection between the probe and the winch is exposed every time a survey takes place, and the O-Ring seal on the barrel of the cable-head can be subject to abrasion. We recommend that this seal is cleaned, inspected, and silicone-greased every time. Any sign of damage to the O-ring, scratches or cuts, should warrant immediate replacement of the seal. Water entering this connection will destroy the connectors very quickly, and can lead to short-circuits, or poor/zero connection to the probe.

   When you unplug the probe, always make a point of checking for the presence of water or corrosion/blackening associated with the probe 4 pin connector.

3. **Power up -** The software runs correctly, and you engage the power to the probe.

   If you are within earshot of the Micrologger, you should hear a click from inside the unit as power is applied to the wireline and connected probe. The Micrologger has a power button which starts to flash as the probe goes live. Software displays can vary, but they generally feature a display of the surface voltage (V) applied to the wireline, and the current (mA) being drawn by the probe. Some software may also indicate a 'Head voltage' which is measured by the probe itself and reported to the logger.

   A conscientious operator will be aware of what is normally seen in these readouts, and any deviation from these is the number one diagnostic for operational problems.

   Zero current can mean the wireline is not properly connected, or the probe has failed catastrophically.

   High current can indicate a short circuit, and further checks can help work out where this might have occurred. In both of these cases, it is almost certain that no data is received from the probe.

4. **Communication -** Probe current and voltage displays seem normal, but when testing the probe for data returns, there is something wrong. The software will usually indicate if communication with the probe is taking place normally, and again a conscientious operator will already know what settings he should be using with the particular probe. No harm in checking these again.

   On occasion, a drift in characteristic of the wireline might require small tweaks to the communication settings. Extreme temperature swings in some climates, for example, have been known to require this. More likely is that the cable-head condition is deteriorating, and this will need to be eliminated at the next available opportunity. If you are on a long campaign, you might have facility to do this in the field.

   However, why did you not renew this before setting out?

5. **Data Issues -** Some probes allow for a means of testing that they are registering data correctly while out in the field with a test box or jig. What could be more reassuring to you or your customers than validating this before a run? Caliper tools are a case in point, and field calibration is ideally done on these for every log. Otherwise, a section of water-filled casing at the top of the borehole might be more appropriate for verification. Suppose the data seems out of whack, or a channel is missing altogether? It is almost certain that a missing channel of data indicates a malfunction in the probe, possibly impact damage as already mentioned. Did you apply the required calibrations or User Functions? Double-check.

6. **Probe or winch? -** In the case of an over-current condition, simply unplugging the probe should cause the current to drop back to zero. If it doesn't, then there is most likely a short in the wireline.

   If the current drops to zero, then the probe is the seat of the problem. Check the condition of the 4 pin connector as previously described. The job for that probe is over, and it will need professional help.

   Do not be tempted to open it yourself; a flooded probe can contain fluid at high pressure.

   If the current is zero, even with a probe connected, you should try another probe if available.

   If the second one works, then the first has a fault.

   If you have access to a multi-meter, a rudimentary check for the presence of probe supply voltage can be carefully made at the cable-head (4 core Pin 4 to Armour, Mono Pin 1 to Armour). If there is no sign of power, then the wireline has a break somewhere. Probe power turned on in software for this one.

WINCH PROBLEMS

Bear in mind that the winch has four important jobs: It mechanically supports the probe, regulates the vertical position of the probe, allows registration of depth, and connects power/data for the probe.

1. **Cable-head -** Most important is the mechanical integrity of the cable-head with the wireline. This needs to be remade by a properly trained operator at sensible intervals, to ensure that a stuck probe can be rescued properly. It is more likely that the grease-packed electrical connections will indicate problems before the mechanical aspect has deteriorated badly. Even so, any hint of trouble, and the cable-head should be remade in order to eliminate it from the crime, and save a great deal of heartache.

2. **Winch drive and spooling -** Mechanical problems with winch drive are unusual, and many Robertson Geo winches are into their third decade in the field with minimal maintenance. Unusual noises during motion of the winch drum should be investigated immediately, as safety is number one priority on a winch.

   Spooling is a matter of experience. Winches with no mechanism for this should positioned 10 Metres away from the borehole, ideally, in order to get a natural spooling action. The 2000M winch has a damper on the passive spooling mechanism, which, like a car shock absorber, may need eventual replacement.

3. **Depth issues -** Similar to the concept of an operator being familiar with comms settings for his probes, the system settings which govern how the winch and logger interact will need to be known, and double checked if a depth problem arises. Depth is measured by the wireline running over a wheel, which may or may not be integral to the winch. A tripod has the added risk of being carelessly thrown into the back of a truck, which can fracture the etched glass disk inside the depth encoder. The encoder has a special coupling to the axle of the wheel, and this can sometimes become displaced. Make sure the encoder and wheel turn in unison. The 15 metre depth lead draped over the site toward the borehole is another target for mechanical damage – inspect it regularly. It can be continuity checked, as the connectors are one-to-one pinouts.

4. **Slip-ring housing -** The slip rings on Robertson Geo winches are of the sealed mercury-wetted type, and are extremely reliable. There is possibility for the housing of this item to be subject to impact, which can cause the mechanical drive linkage to fail resulting in wires twisting off. We have even witnessed individuals sitting on this housing!

5. **19 way data lead -** Similarly to the depth lead, this should be inspected regularly for damage.

6. **Communication box -** The inside of this box, which carries the logger and depth connections to the winch, can be easily inspected with removal of a few screws. Keep an eye out for water ingress or corrosion.

7. **Wireline problems are traditionally tackled by continuity/insulation testing, and visual inspection.**

   Even the armoured wireline cable can be damaged by trapping in a vehicle door, for instance.

   Any bad kinks in the first part of the cable should be cut away during cable-head remaking.

   Generally, assume continuity problems are associated with the cable-head until proved otherwise.

IF IN DOUBT, READ THE MANUAL!

Scan the QR code to go directly to www.robertson-geo.com