

# Field Maintenance for Wireline Geophysical Operations



**Robertson Geo was founded in 1979 and since 1980 have been pioneering the development of digital logging systems, almost a decade before the competition.**

From 1990 the digital surface data acquisition unit was designed to work with a laptop computer. The Micrologger series of compact digital surface acquisition units, launched in 1997, followed this paradigm and still sets the standard to this day. All Robertson Geo probes digitise their data within the probe itself and the winch system transmits only digital data. These digital systems are now extremely robust and can provide years of reliable and repeatable data with relatively little maintenance.



Apart from a few exceptions most probe repairs are best left to the OEM or their agents who have the requisite test and calibration equipment. Winches however require more routine inspection and maintenance. Here we will be considering routine inspection and maintenance that should keep the equipment in optimum working order.



*Use of jetwash for cleaning probes.*

## Commissioning, Training and Support

For equipment sales, on-site commissioning by Robertson Geo or their local agents will be available if required, though this may not be necessary for more experienced clients. Commissioning at a client site will usually be combined with hands-on training from experienced logging engineers. Basic care and maintenance of probes and equipment, covering calibration, cleaning, transport and storage, will be covered these cases. Where commissioning is not taken up engineer training is still available via local agents, on-line or from the company YouTube channel. Post sales support is available through local agents, the Robertson Geo website and via a central support desk.

## The Organisation of Maintenance

The degree to which maintenance needs to be organised will vary depending on how much equipment is in the logging team, the frequency of use and the harshness of logging conditions. As a minimum, for all logging jobs, a full systems test, including the logging laptop, should be conducted prior to mobilisation and probes should be cleaned after logging. This simple expedient should pick up most problems back at base before mobilising to site. Most probes also need to be calibrated regularly and this represents a good opportunity for a more detailed inspection of the condition of the probe. If there is a large pool of equipment, then regular calibration and inspection schedules should be put in place. Feedback from engineers regarding problems or potential problems should be actively encouraged. Probes with caliper arms and winches, i.e. equipment with moving parts, require the most attention.

Resources required to enable calibrations, inspections and routine maintenance to be conducted include tool kits and basic spares ('O' rings, grease etc.), manuals, and for large pools of equipment checklists and schedules. Attention should also be given to the transport and storage of equipment to avoid damage in transit and to ensure equipment is properly cleaned before being stored.

## Land Based Operations

Land based operations fall into two categories, vehicular based and portable or sometimes a combination of the two.

Vehicle based systems usually have the winch and surface units securely fastened into the vehicle which is good for weather protection but may make inspection and maintenance more difficult, to the point where it can be easily ignored. Probes are usually well protected inside dedicated tubes for transport.

For portable systems there are additional hazards from moving and transporting the equipment after every borehole, having the equipment lying on the ground in poor weather and exposure to dirt. It is important to keep all the surface equipment as dry as possible, with laptops being especially vulnerable to water ingress.

## Offshore Operations

The marine environment presents challenges for all equipment, wireline systems being no exception. Robertson Geo have been continually improving the construction materials used throughout their systems to minimise corrosion and in 2017 launched a marine version of their 2,000m



winch specifically for offshore operations. In parallel the PS Logger® probe, popular for OWF work, has also been upgraded with more corrosion resistant materials.

Near-shore work on barges and small jackup platforms operates much like land operations with the added hazard of salt water. Even high-grade stainless steel can corrode if left exposed to a saline environment for anything other than a short time. Saltwater ingress into the cablehead, probe head and winch needs to be carefully controlled by cleaning the probes and electrical connections and checking they are sealing correctly.

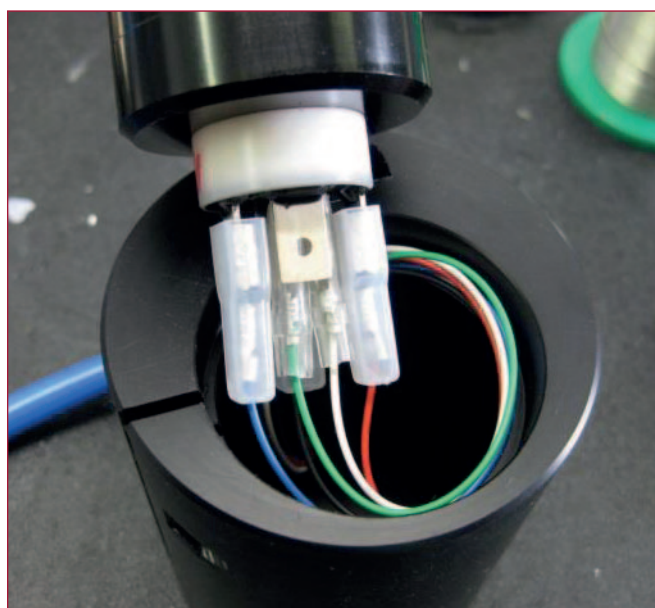
Drill ship and accommodation jackup working, typically for OWF, puts additional pressure on good housekeeping and maintenance. Often working far from shore, it is imperative that everything needed, including spares, is fully checked and tested prior to embarkation as running to port may be cost prohibitive in the event of equipment failure. For drill ships the winch is usually emplaced on the rooster box while the logging operation takes place whereby it may be exposed to salt spray and rain. As the drill ship is in 24/7 operation this makes maintenance difficult, emphasising the need for equipment planning. Tailored spares kits for the Marine Winch and PS Logger®, specifically for offshore operations, are available on request.

## Winch Maintenance

Robertson Geo winches are designed to be as free from maintenance as possible with most components over specified for normal functioning. Checking the winch, cleaning it, and lubricating moving parts with an approved moisture repellent lubricant will suffice for most components. In addition, certain key components should be regularly inspected and those that may be adjusted or repaired easily will be detailed in the manual or on training videos. Common maintenance tasks that can be tackled in the field are noted in the manual.

The cablehead is arguably the hardest working component of the winch system as it is repeatedly opened and then submerged and relies on being packed with grease to maintain electrical isolation. As part of the full system check prior to mobilisation the cablehead should be inspected carefully and the double 'O' rings removed for cleaning and regreasing if necessary. Periodically, the cablehead should be opened and repacked with fresh grease as water can slowly penetrate the cablehead over time. Engineers should always carry sufficient spares and tools to be able to replace a cablehead in the field if necessary. When replacing a cablehead the opportunity should be taken to inspect the top 20m or so of the cable for damage, kinks and wear and cut back if required.

The slip ring assembly provides electrical connection between fixed wires and the rotating drum. This will need to be disconnected to check electrical resistance (mega-testing), for repair or for replacing corroded connections. There are different procedures for 4-core and for coaxial cable types.



**4-Core slip ring connections.**

Depending on the workload and operating environment the slip ring assembly should be taken apart for inspection periodically.

The junction box provides Elog capability and connects the Micrologger to the winch. For 2,000m winches this also houses connections for depth and tension. This unit should be relatively maintenance free but should be opened periodically to check that the seals are good and there is no water ingress.

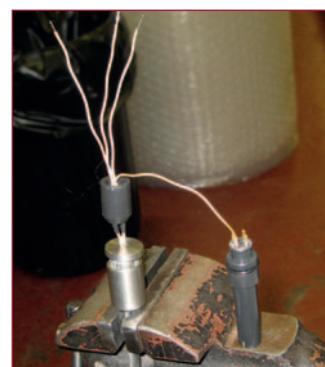
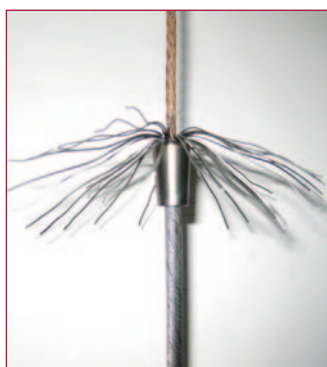
2,000m winches use a drive chain to connect the gearbox to the drum. An approved chain lubricant should be applied regularly to maintain smooth operation. Although relatively maintenance free, the chain may lose tension over time and can be adjusted quite easily. The toothed drive belt on these winches should also be inspected for wear and cracking.

Bearings on the winch used to support the drum (and depth wheel on 2,000m winches) are fitted with a grease nipple for adding fresh grease. As the bearings are sealed it is only after long periods or use in harsh conditions, such as a marine environment, that this should be necessary.

The DC motors used on winches are extremely robust and need only be kept clean to allow the cooling fins to work and the brushes should be checked periodically.

The depth wheel, whether integral with the winch or separate on a tripod head, should be kept clean to ensure correct depth measurement. The depth encoder unit is sealed for life and in the event of failure needs to be replaced.

### *Stages in the remaking of a 4-Core Cablehead.*



On 2,000m winches an optional tension device may be fitted. This comprises a load cell, tension box and a cable to connect to the junction box. The pulley block that actuates the load cell should be checked for smooth movement and connections should be inspected. Components need to be replaced if faulty.

Power cables, data leads and depth cables should be inspected regularly for wear or damage and should be replaced if necessary.

Winch controls should be checked to ensure they are operating smoothly and are fully functional and guards should be securely in place.

A winch continuity check should be performed periodically or in the event of a problem. The procedure for this is detailed in a specific workshop video which should assist with isolating where in the winch system the problem lies. If help is being sought from the support desk for winch issues then a documented continuity check will be most useful for diagnostics.

## Probe Maintenance

The field maintenance of probes is generally confined to inspection and cleaning. The opening up of probes should only be undertaken when the requisite knowledge, tools, test gear and ability to check conformance is in place and is usually best left to the OEM or their agents.

Probes need to operate under extremes of pressure and temperature and visual checks should include the condition of the body tube, tightness of joints and any moving parts. Check also for water ingress and blackening around the pins of the probe head.

The use of a small jetwash is recommended for cleaning probes in the field and back at base. When working in drilling mud, clays or other fine formations it is important not to let mud dry on the probe if possible. Probes with caliper arms are susceptible to the arm mechanism becoming seized in muddy conditions. Care should be taken when using the jetwash as unpressurised 'O' rings may not be properly seated and water from the jetwash can be forced past the 'O' rings. The jetwash head should not be used closer than 30cm to prevent this.

The PS Logger® probe uniquely comprises five or six sections which are assembled in the field. A single 'O' ring is used to prevent water ingress between each section and in a marine environment these should be removed, cleaned and regreased after every borehole, as saltwater left in the 'O' ring groove can cause pitting. The source hammer springs should also be inspected after every job and replaced where damaged or worn.

Cameras and televiewers should have their optical windows cleaned with screenwash before every borehole to obtain the best images. On the acoustic televiewer the end cap, used as part of pressure equalisation, should be removed and thoroughly cleaned.

Water probes need to be kept meticulously clean to ensure smooth operation and to prevent contamination within water wells. Impeller flowmeters should have the impeller protected from air motion if carried externally on a vehicle to prevent excessive rotation of the impeller.

## Other Maintenance

Surface logging equipment requires little maintenance save for checking that connections and cables are in good condition. Centraliser locking collars will gradually stiffen up over time and should be periodically stripped down, cleaned and lightly lubricated. All cables should be visually checked especially close to the connectors. Generators are vital to provide a clean power source and should be regularly serviced by professionals. Sheave wheels should be cleaned and lubricated after every job.



*PS Logger® source stripped for spring replacement.*



## Conclusion

Routine cleaning and checking of equipment should be sufficient to enable equipment to perform well over long periods of time. If equipment is showing faults or not working the diagnosis of the problem can be difficult. Assistance may be sought from the local agent or from the OEM and it is important to document any testing done, such as a winch continuity test, and supply this information to the support desk. Where problems exist that affect the data collected, raw data files should also be submitted to aid diagnosis. Robertson Geo provide a package of resources to assist their clients with the maintenance of their systems from sales support, through commissioning and training to the provision of a support desk, with videos and guides being available on the company website.

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