WATER QUALITY REAL TIME PROBE

YK613

OPERATOR'S MANUAL

Y E O - K A L E L E C T R O N I C S P T Y L T D

Revision R2

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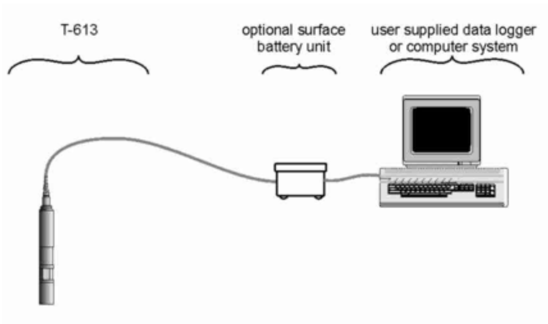
1. Introduction

The T-613 comes already assembled. The only assembly required is to connect the probe to a computer and provide the external power supply.

1.1 General Description

The T-613 Water Quality Analyser Real Time Probe is a multi-parameter probe with sensors for temperature, conductivity, salinity, pH, dissolved oxygen, turbidity and options depth. All the T-613 requires is a 12 Volt power supply then connect the RS232 line into a computer.



It is operational to a depth of 100 meters. Optional Yeo-kalSoft software makes it a complete Water Quality Analyser, with data logging onto the computer and graphical analysis and display.

A comprehensive range of commands gives wide versatility to develop custom installations. Polled data, continuous data, prompted calibration procedures and other functions make it easy to integrate this probe into computers, data loggers or other systems.

1.2 Specifications

Temperature

Range:	-2 - 50ºC
Accuracy:	±0.05ºC
Resolution:	0.01ºC
Type:	pt 100 platinum element

Conductivity

High Range:	0 - 80 ms/cm
Accuracy:	±0.05 ms/cm
Resolution:	0.02 ms/cm
Low Range:	0-8000 us/cm
Accuracy:	±5 us/cm
Resolution:	3 us/cm
Type:	Four electrode cell

Salinity

Range:	0 - 60 ppt
Accuracy:	±0.05 ppt
Resolution:	0.02 ppt
Type:	See Appendix 1 - Conversions Used

Dissolved Oxygen

Range:	0 - 200% saturation 0 - 20 mg/l
Accuracy:	±0.5%
Resolution:	0.1%
Type:	Active silver and lead electrode sensor with PTFE* membrane and built-in stirrer

Turbidity

Range:	0 - 600 ntu
Accuracy:	±0.5 ntu (0 - 300 ntu range) ±5 ntu (300 - 600 ntu range)
Resolution:	0.3 ntu
Type:	Nephelometric measurement from a 90 sensor with pulsed infra-red light source

pH

Range:	0 - 14
Accuracy:	±0.03
Resolution:	0.01
Type:	Combination silver/silver chloride type with sintered Teflon* junction

ORP

Range:	-700 mV to +1100 mV
Accuracy:	±3 mV
Resolution:	1 mV
Type:	Combination bare metal electrode common reference junction with pH electrode (see Appendix 1 - Conversions Used)

Depth (optional)

Range:	0 - 100 m or 0 - 150 m
Accuracy:	±0.5% of full scale
Resolution:	0.1 m
Type:	Dual active silicone strain gauge
Cable length:	3 m or 10 m. Other lengths made to order.
Dimensions:	50 mm diameter, 320 mm long

1.3 Connector Pins

For probes that have a plug-in cable fitted

The connector pins on the PROBE are numbered in clockwise order from the polarising pin The following table lists the purpose of each pin on the connectors.

Pin 1	Ground
Pin 2	RS232 out Tx
Pin 3	RS232 in Rx
Pin 4	Positive 12VDC

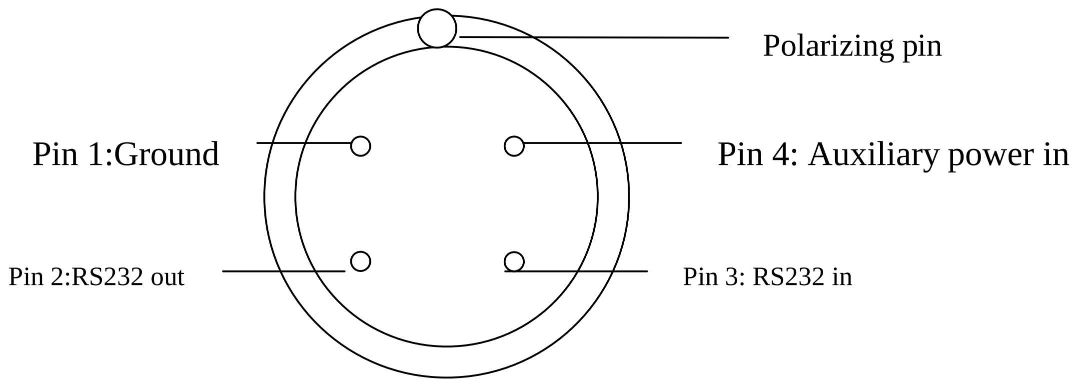


Figure 1: Connector on end of cable – supplied optionally.

1.4 RS232 Configuration

Baud rate-	9600
Data bits	8
Stop bits	1
Flow Control	None

ASCII Setup

Send Line ends with line feeds (<cr><lf>).

1.5 Power Supply

Supply Voltage: 10-18volts Current approx 120ma

1.6 Description of Probe

The probe assembly consists of sensor, cable and connectors. The body of the probe is made of PVC with a PVC sensor guard. The interface cable is permanently connected to the probe body to eliminate the need for underwater connectors. In the event of the cable being cut, the probe has a waterproof seal between the cable connection and the electronics package. At the other end of the cable is a corrosion and water resistant connector for attaching the assembly to the reader unit.

The sensors can easily be accessed by sliding the sensor guard up and

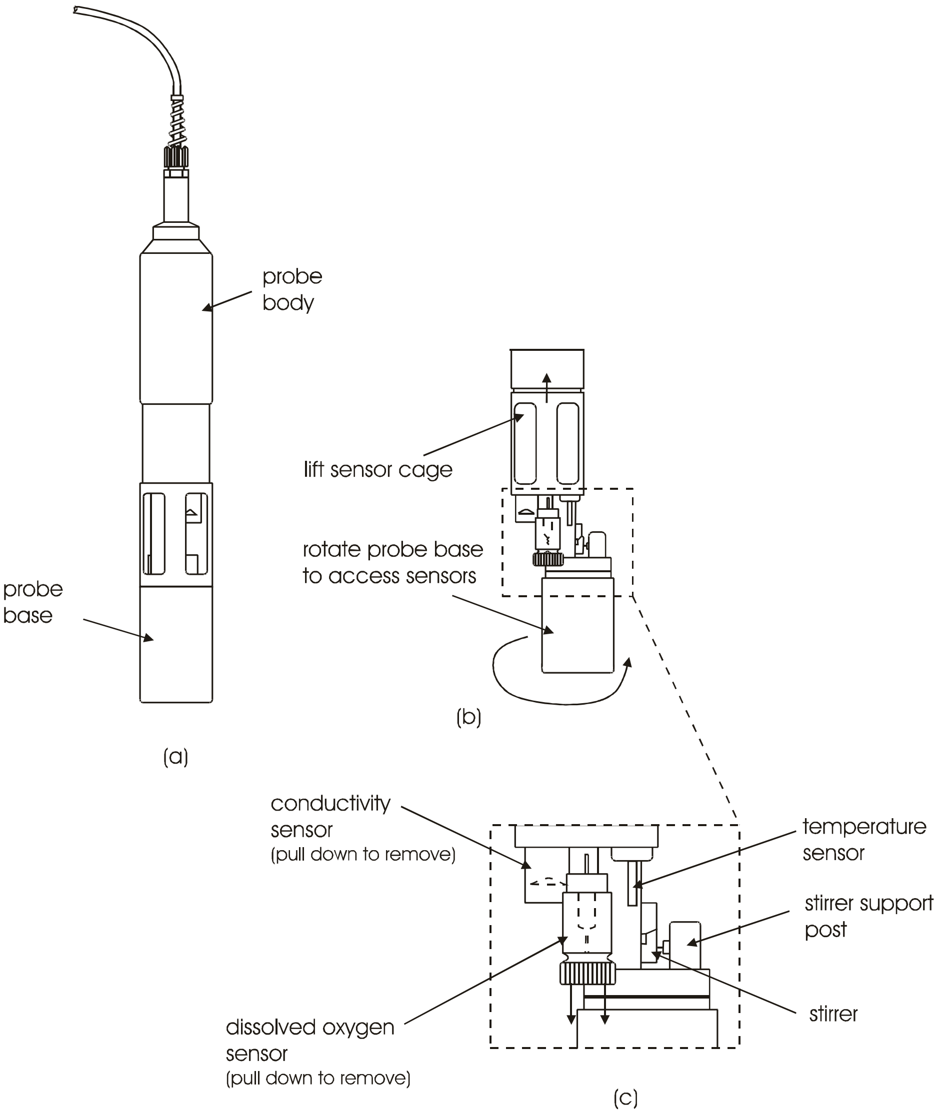


Figure 2: a) Complete probe assembly b) Sensor cluster exposed by lifting sensor cage and rotating probe base C) Expanded view of sensor cluster with dissolved oxygen sensor detached.

rotating the bottom section of the probe. (see fig 2b)

The conductivity and dissolved oxygen sensors can be removed for servicing. However, the whole unit must be **thoroughly dry** before these sensors are removed. A cotton bud can be used to dry the spaces in between the sensors.

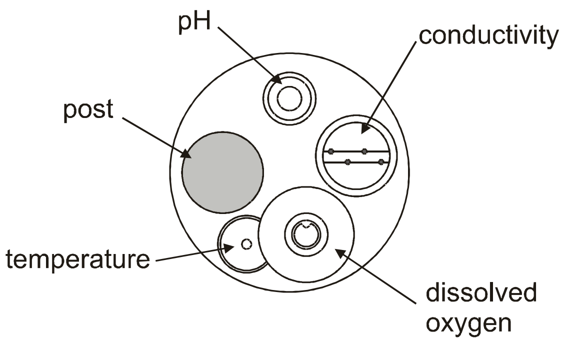


Figure 3: End view of probe (without bottom section) showing position of sensors.

1.6.1 Temperature Sensor

The temperature sensor consists of a pt 100 platinum element, housed in a stainless steel sheath for robustness and corrosion resistance. The temperature sensor requires little maintenance however the temperature measurement is used for calculating the dissolved oxygen in mg/l and for temperature correction of the conductivity sensor and so it is important that the temperature sensor is properly calibrated.

1.6.2 Dissolved Oxygen Sensor

Dissolved Oxygen is measured using an active type membrane covered sensor. The sensor itself consists of silver and lead electrodes and a 25um ptfe membrane and is filled with a 1.0M potassium hydroxide. A constant flow of water passes the sensor which is maintained by a stirrer located on the bottom section of the probe.

When the silver and lead electrodes are connected through the external circuit, electrons pass from the lead electrode to the silver electrode. When oxygen is present at the surface of the silver electrode, it reacts with electrons to produce hydroxyl ions.

At the lead electrode the loss of electrons produces lead ions. The lead's electrons combine with hydroxyl to precipitate lead hydroxide on the lead electrode.

The rate of transference of electrons via the external circuit from the lead to silver electrode ie that is the current flowing in the external circuit, is the measure of the rate of cell reaction and thus the rate at which oxygen reaches the silver electrode. The current flowing in the external circuit is directly related to the oxygen concentration in the sample being measured by the electrodes.

The Dissolved Oxygen sensor may periodically require a new membrane and electrolyte. A unique knurled nut is used to hold the sensor membrane in position without overstressing the membrane. This gives long term stability and allows easy replacement. The sensor can be removed from the probe for servicing. A replacement probe is ready for use immediately after installation and calibration.

1.6.3 Conductivity Sensor

The conductivity is measured using a 4 electrode bridge. The four electrode system uses automatic compensation to overcome any build up of contamination on the electrodes. The electrodes are made from fine platinum and are coated with platinum black to enhance the long term stability and sensitivity of the sensor. The coating should last for a long period of time if it is not mechanically removed, however, the coating can be replaced using the optional platiniser or by returning the sensor to Yeo-kal Technology Pty Ltd.

1.6.4 Turbidity Sensor

The turbidity sensor is located in the hole which runs through the bottom section of the probe and is lined with a glass tube. Turbidity is measured by the nephelometric method which uses a light source and a detector which measures light scattered at 90 degrees to the incident light beam. A pulsed infra-red light source is used.

1.6.5 pH/ORP Sensor

The pH and oxidation reduction potential (ORP) are measured using a single sensor. This consists of a glass pH electrode and a platinum electrode for ORP measurements with a combination internal reference electrode. The sensor only requires maintenance if there is a build up of contamination on the electrodes and/or the reference becomes blocked or depleted of electrolyte.

2. Assembly

The T-613 comes already assembled. The only construction required is to connect the probe to a computer and provide a power supply.

3. Operation

3.1 Command and Response Information

If the operator has software such as Yeo-kalSoft it is not necessary to set up the serial communications port (Yeo-kalSoft sets it up). If the operator is using a terminal program, set the port as described in paragraph **Error! Reference source not found. Error! Reference source not found.**.

3.2 Start Operation

Once the serial port has been set up, type in 00 and press enter, the following commands should appear:

00	Display this command information.
01	Switch probe for data output in T-611 format.
02	Display processed data header.
03	Display processed data. (assigned sensors)
04	Display processed data repetitively. (assigned sensors)
05	Display raw data header.
06	Display raw data. (all sensors)
07	Display raw data repetitively. (all sensors)
08	Calibrate selected sensors.
09	Output calibration constants.
10	Input calibration constants.
11	Assign sensors.
12	Reset to defaults.
13	Displays serial number and software version.

Each command must be followed by a carriage return and line feed pair. For example to display the raw data header send “`05\r\n`”.

3.2.1 00 Display this command information Command

Response:

```
PROBE COMMANDS: (2 numbers followed by CR/LF)
----------------------------------------------------
00  Display this command information.
01  Switch probe for data output in 611 format.
02  Display processed data header.
03  Display processed data. (assigned sensors)
04  Display processed data repetitively. (assigned sensors)
05  Display raw data header.
06  Display raw data. (all sensors)
07  Display raw data repetitively. (all sensors)
08  Calibrate selected sensors.
09  Output calibration constants.
10  Input calibration constants.
11  Assign sensors.
12  Reset to defaults.
13  Displays serial number and software version.

----------------------------------------------------
```

3.2.2 01 Switch probe for data output in 611 format Command

Use this to switch to binary output for use with T-611 Reader Unit.

3.2.3 02 Display processed data header Command

Response:

```
 DEPTH  TEMP   SAL  COND  COND  DO    DO          ORP  TURB
   M      C    ppt  mscm  uscm  %sat  mg/l  pH     mv   ntu
-----------------------------------------------------------
```

3.2.4 03 or 04 Display processed data Command

Response (repetitively for 04):

```
   1.048  0.36 60.00 80.00   46 -10.0 -0.96  0.26    1  22.7
```

3.2.5 05 Display raw data header Command

Response:

```
DEPTH TEMP    C   C*10   DO    pH    ORP  TURB
-----------------------------------------------
```

3.2.6 06 or 07 Display raw data (all sensors) Command

Response (repetitively for 07):

```
  454  -368    25    26   182   394   598  1726
```

3.2.7 08 Calibrate selected sensors Command

Response:

```
CALIBRATION MENU
------------------------
(1) Temperature
(2) Salinity/Cond mscm
(3) Conductivity (us/cm)
(4) Dissolved Oxygen
(5) pH
(6) orp
(7) Turbidity
(8) Depth
(9) Exit to command mode
------------------------
Enter required parameter:
```

And then follow the prompts to carry out the calibration procedure.

3.2.8 09 Output calibration constants Command

Response:

```
Yeo-Kal Model 613 Sensor
Serial number:    0

dd/mm/yy hh:mm  sens   lo sp  lo d  tem l  hi sp  hi d  tem h  offset    slope
--------------------------------------------------------------------------------
01/01/06 15:25  Dpth    0.000   455    N/A   2.000   452   N/A     0.000   433.000
01/01/06 08:43  Temp     3.00   -10    N/A    0.00  1990   N/A     6.900  -999.999
01/01/06 08:52  Cond     0.00    32    N/A    0.00  1370  1.00     0.000     1.000
01/01/06 08:46  C*10        0    23    N/A       0   356 -1.00     0.000     1.000
01/01/06 09:12  D.O.      0.0   208    N/A   100.0  1519 13.00     0.000   -13.000
01/01/06 00:00  pH      10.00     2 -5.00    22.80  -182 99.90     4.000  1660.000
01/01/06 00:00  orp     295.2   668    N/A   472.2    89   N/A   295.200   498.000
01/01/06 00:00  Turb      0.0  1723    N/A     0.0    79   N/A     0.000    76.000
--------------------------------------------------------------------------------
```

3.2.9 10 Input calibration constants Command

Response:

```
Waiting for cal file. (Push ESC to exit)
```

Calibration file to be sent to the probe should be in the same format as that received using 09 Command.

3.2.10 11 Assign sensors Command

Response:

```
Install Depth?
Enter <Y>yes <N>no or <ESC>:
```

And then follow the prompts to set up the other sensors.

3.2.11 12 Reset to defaults Command

Response:

```
OK
```

3.2.12 13 Displays serial number and software version Command

Response:

```
Serial num:   99   Software version: V1.01
```

4. Calibration

4.1 General Procedure

In order to ensure the accuracy of the T-613, the instrument needs to be calibrated on a regular basis as well as after any maintenance has been performed on the probe. The frequency at which calibration is required will depend on the specific application for which the instrument is to be used. The optimum time between calibrations can be established by regularly checking the performance of the instrument in standard solutions. If the T-613 is kept well maintained and calibrated on a regular basis, a single point calibration is sufficient to keep the instrument performing to specification. However, two point calibrations whenever a sensor has had any maintenance.

The calibration procedures require that the probe be immersed in standard solutions. The probe storage container which is supplied with the T-613 is ideal for this purpose as it provides a water tight seal on the probe and minimizes the volume of standard solution required (about 150 ml). Make sure that you rinse both the probe and container before each calibration and between each calibration solution. The standard solutions are available from Yeo-kal Technology Pty Ltd or most major scientific suppliers. Further information on preparation of calibration solution is available from the Yeo-kal web site http://www.yeo-kal.com.au/bulletins/bull1.html

Dissolved oxygen and conductivity measurements require a correction for temperature (this correction is automatically made by the instrument) hence the temperature sensor must be correctly calibrated before you can calibrate either the dissolved oxygen or salinity / conductivity sensors.

To enter the calibration menu, send "`08\r\n`" (Calibrate selected sensors) and follow the prompts.

4.2 Temperature Calibration

The temperature calibration should vary very little over the lifetime of the instrument however it is worth checking on the accuracy of your temperature measurements before calibrating the dissolved oxygen or salinity sensors.

Temperature calibration is performed at two temperatures. The low temperature must be between 0 and 20 C and the high temperature must be between 30 and 50C.

4.3 High Conductivity/Salinity Calibration

The conductivity/salinity sensor is calibrated using solutions with a salinity of 0 ppt (air calibration) and 35 ppt. Conductivity is a parameter derived from the salinity measurement and so calibrating salinity simultaneously calibrates the conductivity measurements. Before calibrating the sensor, first, ensure that the temperature sensor is reading accurately and, if necessary, perform the temperature calibration described above.

4.4 Low Conductivity calibration

The Low conductivity sensor is calibrated using a conductivity of 0 us/cm with the sensor in air and a KCl solution (typically 1413 us/cm prepared by dissolving 0.7459 grams anhydrous KCl in distilled water and making up the solution to 1 litre).

Other conductivities can be selected between 500 to 8000 us/cm. It is advisable to use the solution of KCl which has the conductivity of 1413us/cm. The calculation for temperature correction is at its optimum when this value is used. If other standards are used the temperature changes in the sample will cause small changes in the displayed conductivity.

4.5 Dissolved Oxygen calibration

Dissolved oxygen calibration is performed using solutions with zero % or 100% oxygen saturation. To prepare a sample with zero % saturation, dissolve 26 grams of sodium sulphite in 500 ml of water and add 0.2 grams of cobalt chloride. Stir the solution until the crystals are dissolved. Discard the solution after 30 minutes as it will begin to absorb oxygen. To make a solution with 100% saturation, aerate a sample of fresh water for about two hours. A fish tank air pump and bubbler is ideal for this purpose.

4.6 pH Calibration

The pH sensor is calibrated using buffer solutions with a pH of 4 - 7.5 and 8-12.

4.7 ORP Calibration

Oxidation reduction potential is calibrated using standard solutions producing ORP of 295.2 mV and 472.2 mV.

To prepare the 295.2 mV solution, measure out enough pH 7 buffer to cover the ORP sensor and saturate the solution with quinhydrone. This will only require a small amount of quinhydrone and is best done by adding a pinch and then stirring for 30 seconds. There should still be solid, undissolved quinhydrone in the solution. If no solid is seen, add an additional amount and repeat stirring until solid quinhydrone is seen. To prepare the 472.2 mV standard, repeat the above except use pH 4 buffer instead of pH 7.

4.8 Turbidity Calibration

The turbidity sensor is calibrated using solutions with a turbidity of 0 ntu (distilled water) and a high value between 100 - 300 ntu's. These solutions can be prepared by diluting a concentrated formazin solution. Beware, formazin is a suspected carcinogen. Always wear rubber gloves when handling formazin solutions. Note: Always clean the glass tube before calibration.

4.9 Depth calibration

If the optional depth sensor is fitted then it will also require calibration. To perform the depth calibration you need to lower the probe to a known depth in the water. This can be done by placing a mark on the probe cable at a measured distance from the bottom of the probe assembly then, making sure that the probe cable is vertical, lower the probe until the mark is at the surface of the water.

5. Maintenance

5.1 D.O. Sensor Maintenance

To maintain the performance and accuracy of the dissolved oxygen sensor, the membrane should also be replaced if it becomes damaged or contaminated with organic matter. Clean the membrane with cotton wool saturated with alcohol

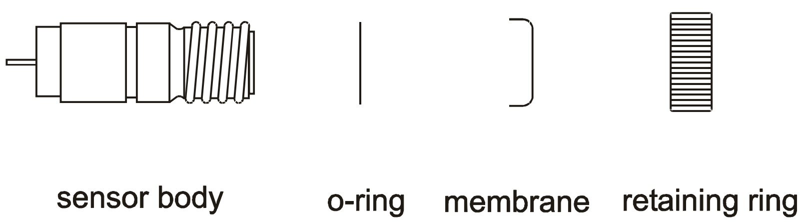


Figure 4: Exploded view of dissolved oxygen sensor.

5.1.1 Changing the Membrane

To change the membrane, perform the following steps, refer to figure 5.

1. Remove the dissolved oxygen sensor from the probe. To do this, lift the sensor guard and rotate the bottom section of the probe to expose the sensors. Ensure that the probe and sensors are completely dry. Use a cotton bud to dry the area between the sensors. Using pliers, lever the dissolved oxygen sensor out of the probe.
2. Unscrew the retaining ring and remove the old membrane.
3. Check the O-ring and discard if it is damaged then flush out the old electrolyte.
4. To refill with electrolyte (1.0 M KOH), hold the probe vertical and place the nozzle of the squeeze bottle beside

the silver electrode. Squeeze the bottle to fill the probe with electrolyte until it flows over the top of the probe.

5. Be sure that there are no bubbles inside the sensor.
6. Take a new membrane and centralise it on top of the electrode and let it float on the surface.
7. Place the retaining nut over the membrane and screw down firmly so that the membrane is well tensioned.
8. Check that there are no bubbles in the electrolyte. If bubbles are found, repeat the above procedure.
9. Apply a smear of O-ring grease to the body of the sensor and push it back into the probe. Be sure not to damage the membrane and be sure to push the sensor in until it clicks into place
10. **Wait at least 2 hours for the sensor to stabilise** then recalibrate the dissolved oxygen readings.

5.1.2 Dissolved Oxygen Stirrer Maintenance

The Stirrer for the dissolved oxygen sensor is a magnetically operated paddle which oscillates and forces water past the sensor membrane. This stirrer may occasionally become clogged, particularly if the water you are testing contains a large amount of magnetic particles. To remove the stirrer paddle for cleaning, proceed as follows:

1. Loosen the two retaining screws in the stirrer support posts, (refer to figure 3), do not remove them.
2. Remove the stainless steel pin on which the paddle is held by pushing it from one end. Be very careful to not lose the spacers which are between the paddle and support posts.
3. Clean the paddle and replace it in the reverse order. Do not over tighten the retaining screws or you will strip the thread in the support post.

5.2 pH/ORP Sensor Maintenance

To service the pH sensor it is better to remove the sensor from the probe housing. This done by drying the probe by shaking of excess water and drying as best as possible. Then move the probe cage up and swivel the bottom section to one side. Firmly grasp the pH sensor and pull down.

Slow response or non-reproducible measurements are signs that the electrodes have become coated or clogged. The glass electrode is susceptible to coating by many substances. The speed of response, normally 95% of the reading in less than 10 seconds, is dramatically changed if a coating is present. Usually a rinse with methyl alcohol will remove any films on the glass and restore the speed of response.

If the methanol rinse does not restore the response, soak the sensor in 0.1 Molar HCl for five minutes. Remove and rinse the sensor with water and place in 0.1 Molar NaOH for five minutes. Remove and rinse again, then place the sensor in pH 4.0 buffer for 10 minutes. The response should now be improved. Do not use abrasive cleaners as this will destroy the sensor.

After cleaning the sensor, be sure to recalibrate both pH and ORP.

If cleaning the sensor does not restore performance, the sensor will have to be replaced.

The pH and ORP electrodes share a common reference (half cell). As the electrolyte gel becomes exhausted it can become replaced by water and the pH and ORP sensors become unstable. Unplug the pH sensor as previously described. An indication if water is present is that the viscosity is low compared with gel. The can be seen though the pH sensor housing. If there is water present either replace with a new pH sensor or return the sensor to Yeo-kal for regelling.

5.3 Turbidity Sensor Maintenance

The turbidity sensor requires little maintenance except ensuring that the glass tube is kept clean. Do not use an abrasive cleaner. Clean the tube with a soft rag and, if required, detergent. Make sure that you rinse the probe so that there is no residual detergent film to interfere with the sensor optics. Make sure that you recalibrate turbidity after cleaning the sensor.

5.4 Conductivity Sensor Maintenance

To maintain the performance and accuracy of the conductivity / salinity sensor, the electrodes need to be periodically cleaned and if the platinum black coating is damaged, the electrodes will need to be re-platinised.

Inspect the sensor on a regular basis. If there is any evidence of a build up of contamination on the electrodes, then the sensor should be removed and cleaned using the platiniser unit as described below. If the platinum black coating is damaged, the electrodes should be cleaned and then re-platinised. To perform these operations, proceed as follows:

1. To remove the sensor, lift the sensor guard and rotate the bottom section of the probe to expose the sensors. Ensure that the probe and sensors are completely dry. Use a cotton bud to dry the area between the sensors. Pull the conductivity sensor down out of the probe by hand. Do not twist the sensor. Ensure that the vacant sensor socket is kept completely dry.
2. To clean the electrodes, plug the sensor into the platiniser unit. Connect the unit to a 6V power supply (such as a lantern battery). Fill the platiniser with 0.1M HCl and switch on the platiniser for 5 minutes. Switch off the platiniser and rinse with distilled water. Now inspect the electrodes. If the platinum black coating is intact, replace the sensor in the probe assembly as described in step 5 below. If the electrodes need to be re-platinised, proceed as follows.
3. To strip the old platinum black coating from the electrodes, plug the sensor into the platiniser unit fill with 5M HCl. Connect the unit to a 6V power supply and switch the unit on. The old platinum black will be stripped off the electrodes. Once completed, switch the platiniser off and rinse with distilled water.
4. To replace the electrode coating, plug the sensor into the platiniser unit and connect to a 6V power supply. To make the platinising solution, mix 3g of chloroplatinic acid with 0.3g of lead acetate and top up to 100ml with distilled water. Fill the platiniser with platinising solution and switch the unit on for 10 minutes. The electrodes will be

plated with a sooty black coating. When complete, rinse the unit and electrodes with distilled water then fill the unit with 0.1M HCl and switch on for 2 minutes to remove any occluded platinum black solution remaining on the electrodes. Rinse the sensor and platiniser with distilled water and install the sensor in the probe assembly.

5. Before installing the conductivity sensor into the probe assembly, make sure that both the sensor and probe assembly are dry. Apply a smear of vacuum grease to the sensor body to ensure that a water tight seal is achieved. The sensor can only be installed with the black dot on the electrode housing pointing to the outside of the probe. Align the sensor and push it into the probe assembly. Be sure to recalibrate the salinity and low conductivity.

6. Storage

When storing the instrument, the pH electrode should be kept moist in a solution of 3M KCl (approximately 22 grams of KCl dissolved in water to make 100 ml of solution). It is advisable to buffer this solution to bring it to approximately pH 5 or 6.

This solution may be contained in either the small pH sensor cap (in some T-613 models) or in the probe storage canister:

- If the T-613 pH sensor has a small cap around it, this simply pushes into place. The solution can be put into this cap for storage of the pH sensor. A small piece of cotton wool inside the cap can be used to absorb the solution, creating a sufficiently damp environment. If this method is used, a drop of clean water should be put into the storage container to keep air around the DO sensor damp.

  CARE SHOULD BE TAKEN when removing or replacing this cap. The cap should be carefully PULLED OFF, DO NOT ATTEMPT TO UNSCREW IT. The glass sensor is EXTREMELY DELICATE and should not be bumped or touched.

  Alternatively, the probe storage canister may be used to hold the storage solution.

- The T-613 comes with a storage canister which clamps onto the probe providing a waterproof seal. Enough storage solution should be put into the canister so that the pH sensor is kept wet. This allows the instrument to be stored and transported with the sensors kept immersed in the storage solution.

7. Appendix 1 - Conversions Used

The T-613 measures dissolved oxygen as % saturation and then automatically converts the reading to milligrams per litre. This conversion is calculated from the dissolved oxygen solubility tables found in International Oceanographic Tables vol.2. National Institute of Oceanography 1972.

The conversion between conductivity and salinity is performed using the Practical Salinity Scale. UNESCO Technical Papers in Marine Science 1983.

The conversion of low conductivity raw data to conductivity referenced to 25 Deg C is performed using constants derived from HANDBOOK OF CHEMISTRY AND PHYSICS, 1963, Chemical Rubber Publishing Company, Page 2691, Conductivity of Standard Solutions using KCl, 0.001 M solution.

Redox potential (ORP) conforms to International Standard IEC 746-5, “Expressions of Performance of Electrochemical Analyzers, Part 5: Oxidation-Reduction potential”. In accordance with this standard, the Redox potential is referred to the standard (“normal”) hydrogen electrode (NHE) and is expressed in mV.

8. Appendix 2 - Compliance

N 10255

9. Appendix 3 - Part Numbers

Part Number	Description
T-613-001	Probe assembly
T-611-002	Cable assembly
T-611-003	Dissolved oxygen sensor
T-611-004	pH/ORP sensor
T-611-005	Conductivity sensor
T-611-006	Depth sensor
T-611-007	Dissolved oxygen membrane
T-611-008	Dissolved oxygen O-ring
T-611-009	Dissolved oxygen membrane retaining ring
T-611-010	Dissolved oxygen electrolyte
T-611-011	Platiniser unit
T-611-012	Platinising solution
T-611-013	Sensor storage solution
T-611-014	pH buffer 4.0 1 litre
T-611-015	pH buffer 10.0 1 litre
T-611-016	Salinity standard 35.00 ppt 1 litre
T-611-017	Formazin solution 1 litre
T-611-026	Sensor bulk head connector
T-611-027	Yeo-kalGraph graphics software