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USER MANUAL

Model	618 Water Quality Analyser For firmware V4.00
Version	1.1
Date	20/4/2020

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Chlorophyll Addition

Principle: Chlorophyll will emit an infrared light when excited by a blue light which is detected by a filtered detector.

Introduction

The YK618 comes already assembled. The only construction required is to connect the probe assembly to the Reader Unit.

General Description

The model 618 Water Quality Analyser Reading Unit is a robust multi-parameter field instrument which can be used for real time water quality measurements or for remote operation using a built in data logger.

The instrument consists of a multi-sensor probe and a reader unit which can store and display data. Additional auxiliary analog probe inputs can be facilitated on the reader unit. The probe and reader unit have been designed to be compact, durable and easy to use. Data is transferred to the reader unit using Bluetooth. The Reader Unit controls the operation of the instrument, provides easy access to the data, control, memory and calibration functions. The Reader Unit contains a real time clock and all stored data includes the date and time of measurement. Both stored data and calibration information can be easily down loaded to a computer using the data transfer program, YK Quick Terminal.

The YK618 comes with storage container to protect the sensors while the instrument is in storage.

The battery charging is available for this reading unit.

Specifications

Reader Unit:

Display:	TFT LCD with colour selectable display. All sensors of real time data can be displayed within one screen and on a computer at the same time.
Memory:	Remote logging – Maximum 65536 samples. Real time (STORE key) maximum 8192 samples. All samples include date, time, GPS and data tag if assigned. Memory's data can be kept for 10 years without battery.
Data tags:	You may type your own tag name or automatically generated by this reader unit according Time and Date, you older tag name or GPS data. Note: each data tag is limited to 18 characters long.
Sample Rate:	Logging time can be easily set from 3 seconds to 1sample every 24 hours. Display updates every 1 second.
ADC:	18bit ADC for probe and old models having 13bit ADC
Communications:	Baud rate 9600, 8 data bits, 0 parity, 1 stop bits.
Power:	Battery containing 2.2AH rechargeable lithium battery.
Case:	Impact resistance polycarbonate; waterproof display, keypad, connectors and case.
Dimensions:	100 mm X 35 mm X 200 mm
Weight:	0.4 kg

Sensors:**Temperature**

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

Conductivity

HighRange:	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: -1100 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: $\pm 0.5\%$ of full scale

Resolution: 0.1 m

Type: Dual active silicone strain gauge

Chlorophyll(optional)

Type: Pulsed blue light source and infrared detection

Range; 0- 500 ug/litre

Accuracy: $\pm 1.0\%$ of full scale

Resolution: 0.1ug/litre

Physical

Cable length: 3 m or 10 m. Other lengths made to order up to 100 meters.

Dimensions: 50 mm diameter, 320 mm long

Description of Reader Unit

The Reader Unit is housed in a tough, durable, high impact polycarbonate case with a keypad and TFT LCD display mounted on the front panel. The side of the case has probe/charging connector. The connectors also have a polarising pin so that incorrect connection cannot be made. Inside the Reader Unit a CPU controls the operation of the instrument, memory stores data and one rechargeable battery power the instrument.

Connector Pins

The connector pins on the Reader Unit connectors are numbered in clockwise order from the polarising pin (see figure 1). The following table lists the purpose of each pin on the connector.

Communications		Auxiliary Power	Sensor
Pin 1	Ground	Negative	Ground
Pin 2	RS232 out	Positive	Data
Pin 3	RS232 in	n/a	+12V

618 Water Quality Analyser Reading Unit and Probe



Figure 1: Reader unit for the YK618

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 internal electronics package. At the other end of the cable is a corrosion and water resistant connector for connection to the Reader Unit.

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

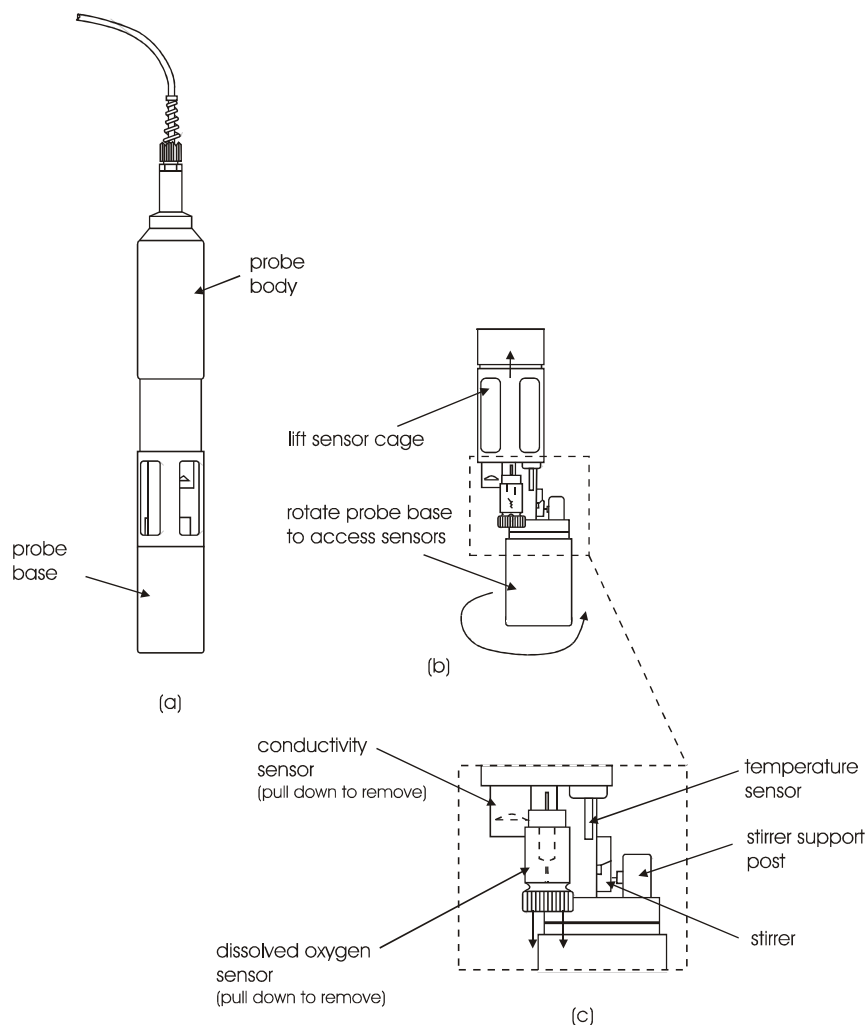


Figure 2: a) Complete probe assembly b) Sensor cluster exposed by lifting sensor cage and rotating probe base c) Expanded view of sensor cluster with dissolved oxygen sensor detached.

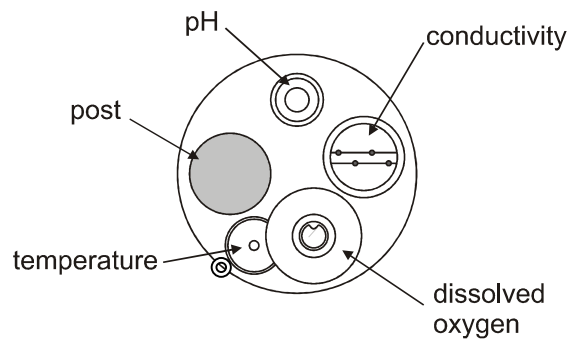


Figure 3: End view of probe
(without bottom section)
showing position of sensors.

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, so it is important that the temperature sensor is properly calibrated.

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 25µm PTFE membrane and is filled with a 1.0M potassium hydroxide. A constant flow of water passes the sensor, 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.

Conductivity Sensor

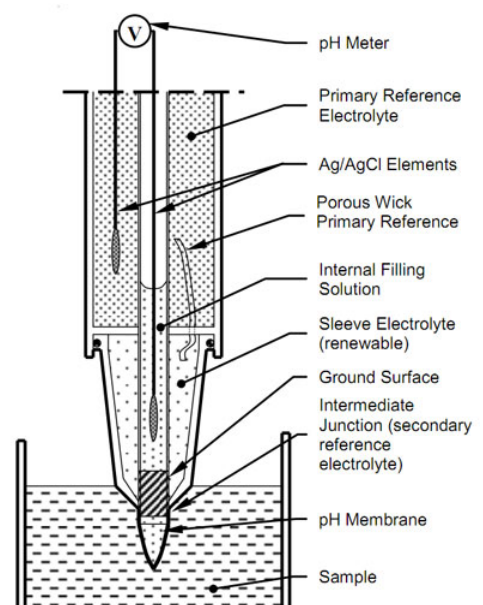
The conductivity is measured using a 4 electrode bridge. The four electrode system uses automatic compensation to overcome any build-up of contamination on the electrodes. The electrodes are made from fine platinum and are coated with platinum black to enhance the long term stability and sensitivity 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 Electronics Pty Ltd.

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 measuring the light scattered at 90 degrees to the incident light beam. A pulsed infra-red light source is used.

PH/ORP Sensor

The pH and oxidation reduction potential (ORP) are measured using separate pH sensor and bare metal platinum electrode for ORP. They both share an internal reference electrode in the pH sensor. This sensors has a refillable secondary junction for sensor maintenance. This sensor with maintenance helps combat accumulation of internal contamination.



Assembly

The YK618 comes already assembled. The only construction required is to connect the probe assembly to the Reader Unit .

Connecting the Probe Assembly

To attach the probe assembly, first unscrew the knurled connector cap from the SENSOR connector of the Reader Unit. The connector cap is attached to the Reader Unit by a chain so that it can be replaced whenever the probe assembly is disconnected. To connect the probe assembly, align the locating pin on the Reader Unit with the slot on the cable connector and push the cable connector into the Reader Unit sensor connector then screw home the retaining ring.

Operation

The YK618 comes already assembled. The only construction required is to connect the probe assembly to the Reader. If the pH sensor has a cap over it, the cap should be removed (**SLIDE THE CAP OFF, DO NOT UNSCREW**) prior to operation. See section 6 for **IMPORTANT INFORMATION**.

Operating Instructions

The following is provided as a quick reference for operation of the instrument. To gain maximum performance and reliability from the YK618, make sure that you read and understand the entire user manual before operating the instrument.

The instrument is switched on or off by pressing the button of the ON/OFF key for about 3 seconds.



When the unit is switched on, the display will briefly show the serial number of the instrument and the version number of the software loaded in the Reader Unit. If the probe is connected, the display will then automatically begin to show the value of readings from the probe. The parameters displayed will be all parameters at one time.

From here, the main menu is entered by pressing the **MENU** key. If the sensor is not connected, the LCD display will show no sensors have been used. Press main menu to scroll through the menu options, press the **arrow** keys to select a menu items as indicated by the arrows on the LCD display.

Key Pad Description

Time: It is automatically displayed on top right of the main menu.

MENU: Select Main menu.

STORE: Store data in real time and by holding down the key, a data tag can be entered.

ESC: To exit a particular routine.

ENT: To accept a particular routine

Arrows: Up, Down, Left or Right Forward used in the main menu and tagging data.

The menu options are as follows:

Main Menu

- | | | |
|----|-----------------|---|
| 1. | Calibration | Calibrate sensors |
| 2. | Logger Settings | Clear Memory, Logging settings and arm |
| 3. | Real Time | Real time data display |
| 4. | Upload to PC | Upload data and constant to PC by Bluetooth |
| 5. | U620 ->&<- PC | PC directly connected to U620 Probe by Bluetooth |
| 6. | R618 Settings | Set clock, R618 reading unit display format, real time display on PC etc. |
| 7. | Special Info | Blue tooth pairing, software ver., unit status |

The Reader Unit can be turned off without losing any of the instrument settings. If the logger is activated, the unit will continue to record measurements.

Store Data Out (1)

The Reader Unit has two separate memories: the store memory and the logger memory. The logger memory can hold up to 16384 readings and the store memory can hold up to 4096 readings. Once stored, the data can then be down loaded into a computer via Bluetooth.

The store memory is used to hold spot measurements. To store a reading while in the field simply press the **STORE** key. The data will be down loaded in the order in which it is stored so keep a record of the site at which each measurement was made so that the data can be easily analysed.

Clear Store Memory (2)

From the main menu select Logger Settings press the ENTER and then selecting Clear 618 (or 620) Memory. Press ENT and the operator will proceed and clear memory.

Start Logger (3)

The YK618 can also be programmed to take measurements at regular intervals and store the results in the logger memory.

The fastest sample rate in Standard Logging Mode is one per two minutes, the stirrer is activated one minute before the sample is to be taken and will switch off immediately after the data has been recorded.

Programming the Reader Unit

To program the logger for a measurement routine, perform the following steps:

1. Enter the main menu, select Logger Settings and press **ENTER**. Then follow ON Screen instructions.
2. Set Logger Tag if want a tag name for the logging.
3. Set Start/Stop time and sample rate and press STORE button for arm the logging.

The instrument is now programmed. The logger will automatically switch on the stirrer 1 minute before the programmed Start time.

To halt the logging process, select ESC key and follow the on screen instruction.

Logged Data Out (4)

Data stored in the YK618 can be down loaded to a computer by bluetooth and then stored, graphed or printed out using most popular applications. When the data is down loaded, it includes a header, as shown in figure 4 below, indicating whether the data is from the logger or store memory.

In order to download the data stored in memory to a computer, you will need terminal software ie YK Quick Terminal or similar. To transfer data, perform the following operations:

1. From Main MENU select Upload to PC and press ENT.
2. Pair PC Bluetooth to R618 read unit.
3. Calibrated constants or All Data or STO data (the data is sampled/stored in real time by pressing STORE) will be selected and transferred to PC.

```

$H
Ver: 1.27
$H
YEO-KAL MODEL 618
SERIAL NUMBER: 625
DATE OF DOWNLOAD: 13/04/17 11:08
DATE FORMAT: DD/MoMo/YY HH:MM:SS

Port      Param      Date      Time      lo dat    lo sp    lo temp  hi dat    hi sp    hi temp  offset    slope
-----$D
Ser4 Phyco (ppb) 24/03/17 12:57 111      0      0.00    30613    4500    0.00    -111.000  6.778
Ser0 E.C (uscm)  23/03/17 13:26 8        0      0.00    2367     1413    26.34    8.000    1.626
Ser1 Sal (ppt)   23/03/17 13:29 9        0.00    0.00    8969     35.00    26.82    9.000    162934.43
Ser2 Temp (C)    23/03/17 13:25 -5605    14.60    0.00    12818    35.50    0.00    18474.656 881.483
Ser3 Turb (ntu)  23/03/17 13:50 -611     0.0      0.00    4840     200.0    0.00    611.000  27.255
Ser5 pH (pH)     23/03/17 13:38 13855    4.00    26.15 -14074    10.00    26.49 32440.386 -4629.346
Ser6 ORP (mv)    23/03/17 13:41 6120     295     0.00    7284     472     0.00    -4178.687 6.576
Ser7 D.O. (%sat) 23/03/17 13:46 -125     0.0      0.00    10449    100.0    25.06    -125.000 49.568
Aux0 Aux chan 0  Not calibrated.
Aux1 Aux chan 1  Not calibrated.
Aux2 Aux chan 2  Not calibrated.
Aux3 Aux chan 3  Not calibrated.
Aux4 Aux chan 4  Not calibrated.
$H-----

Samples in memory: 0027
ID,Tag,Date/Time,Phyco (ppb),Temp (C),E.C (uscm),E.C (mscm),Sal (ppt),Dens(g/cm3),S.G. (sg),TDS (g/l),D.O. (%sat),D.O. (mg/l),pH (pH),ORP (mv),Turb (ntu),GPS
Latitude,GPS Longitude
1,A36,24/03/17 14:48:37,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
2,A36,24/03/17 14:48:39,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
3,A36,24/03/17 14:48:40,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
4,A36,24/03/17 14:48:41,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
5,A36,24/03/17 14:48:43,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
6,A36,24/03/17 14:48:44,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
7,A36,24/03/17 14:48:45,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
8,A36,24/03/17 14:48:47,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
9,A36,24/03/17 14:48:48,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
10,A36,24/03/17 14:48:49,-15,26.25,0,0,0,6.17,-900,40,95.8,7.73,0,0.9967,996.56,000 00.0000',000 00.0000'
11,A36,31/03/17 09:22:16,-15,21.64,0,0,0,7.45,900,75.8,69.6,6.13,0,0.9979,997.7,000 00.0000',000 00.0000'
12,A36,31/03/17 09:22:18,-15,21.64,0,0,0,7.45,900,75.8,69.6,6.13,0,0.9979,997.7,000 00.0000',000 00.0000'
13,A36,31/03/17 09:22:21,-15,21.64,0,0,0,7.45,900,75.9,69.6,6.13,0,0.9979,997.7,000 00.0000',000 00.0000'
14,A34,31/03/17 09:22:46,-15,21.66,0,0,0,7.45,900,76.69,6.13,0,0.9978,997.69,000 00.0000',000 00.0000'
15,A34,31/03/17 09:22:49,-15,21.66,0,0,0,7.45,900,76.1,69.6,6.13,0,0.9978,997.69,000 00.0000',000 00.0000'
16,E26,31/03/17 09:23:14,-15,21.67,0,0,0,7.45,900,76.1,69.6,6.12,0,0.9978,997.69,000 00.0000',000 00.0000'
17,E26,13/04/17 11:06:51,-15,20.84,0,0,0,6.43,768,134.5,49.1,4.39,0,0.998,997.87,000 00.0000',000 00.0000'
18,E26,31/03/17 09:23:14,-15,21.67,0,0,0,7.45,900,76.1,69.6,6.12,0,0.9978,997.69,000 00.0000',000 00.0000'
19,E26,13/04/17 11:06:51,-15,20.84,0,0,0,6.43,768,134.5,49.1,4.39,0,0.998,997.87,000 00.0000',000 00.0000'
20,E26,31/03/17 09:23:14,-15,21.67,0,0,0,7.45,900,76.1,69.6,6.12,0,0.9978,997.69,000 00.0000',000 00.0000'
21,A36,31/03/17 09:22:16,-15,21.64,0,0,0,7.45,900,75.8,69.6,6.13,0,0.9979,997.7,000 00.0000',000 00.0000'
22,A36,31/03/17 09:22:18,-15,21.64,0,0,0,7.45,900,75.8,69.6,6.13,0,0.9979,997.7,000 00.0000',000 00.0000'
23,A36,31/03/17 09:22:21,-15,21.64,0,0,0,7.45,900,75.9,69.6,6.13,0,0.9979,997.7,000 00.0000',000 00.0000'
24,A34,31/03/17 09:22:46,-15,21.66,0,0,0,7.45,900,76.69,6.13,0,0.9978,997.69,000 00.0000',000 00.0000'
25,A34,31/03/17 09:22:49,-15,21.66,0,0,0,7.45,900,76.1,69.6,6.13,0,0.9978,997.69,000 00.0000',000 00.0000'
26,E26,31/03/17 09:23:14,-15,21.67,0,0,0,7.45,900,76.1,69.6,6.12,0,0.9978,997.69,000 00.0000',000 00.0000'
27,E26,13/04/17 11:06:51,-15,20.84,0,0,0,6.43,768,134.5,49.1,4.39,0,0.998,997.87,000 00.0000',000 00.0000'

```

Figure 4b: Sample of comma separated data output from the YK618 (date format: dd/mm/yy).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
25	Samples in memory: 0027																			
26	ID	Tag	Date/Time	Phyco (pp	Temp (C)	E.C (uscm)	E.C (mscm)	Sal (ppt)	Dens(g/cm	S.G. (sg)	TDS (g/l)	D.O.(%sat	D.O.(mg/l	pH (pH)	ORP (mv)	Turb (ntu)	GPS Latitu	GPS Longitude		
27	1	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
28	2	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
29	3	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
30	4	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
31	5	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
32	6	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
33	7	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
34	8	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
35	9	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
36	10	A36	24/03/2017 14:48	-15	26.25	0	0	0	6.17	-900	40	95.8	7.73	0	0.9967	996.56	000 00.000	000 00.0000'		
37	11	A36	31/03/2017 9:22	-15	21.64	0	0	0	7.45	900	75.8	69.6	6.13	0	0.9979	997.7	000 00.000	000 00.0000'		
38	12	A36	31/03/2017 9:22	-15	21.64	0	0	0	7.45	900	75.8	69.6	6.13	0	0.9979	997.7	000 00.000	000 00.0000'		
39	13	A36	31/03/2017 9:22	-15	21.64	0	0	0	7.45	900	75.9	69.6	6.13	0	0.9979	997.7	000 00.000	000 00.0000'		
40	14	A34	31/03/2017 9:22	-15	21.66	0	0	0	7.45	900	76	69.6	6.13	0	0.9978	997.69	000 00.000	000 00.0000'		
41	15	A34	31/03/2017 9:22	-15	21.66	0	0	0	7.45	900	76.1	69.6	6.13	0	0.9978	997.69	000 00.000	000 00.0000'		
42	16	E26	31/03/2017 9:23	-15	21.67	0	0	0	7.45	900	76.1	69.6	6.12	0	0.9978	997.69	000 00.000	000 00.0000'		
43	17	E26	13/04/2017 11:06	-15	20.84	0	0	0	6.43	768	134.5	49.1	4.39	0	0.998	997.87	000 00.000	000 00.0000'		
44	18	E26	31/03/2017 9:23	-15	21.67	0	0	0	7.45	900	76.1	69.6	6.12	0	0.9978	997.69	000 00.000	000 00.0000'		
45	19	E26	13/04/2017 11:06	-15	20.84	0	0	0	6.43	768	134.5	49.1	4.39	0	0.998	997.87	000 00.000	000 00.0000'		
46	20	E26	31/03/2017 9:23	-15	21.67	0	0	0	7.45	900	76.1	69.6	6.12	0	0.9978	997.69	000 00.000	000 00.0000'		
47	21	A36	31/03/2017 9:22	-15	21.64	0	0	0	7.45	900	75.8	69.6	6.13	0	0.9979	997.7	000 00.000	000 00.0000'		
48	22	A36	31/03/2017 9:22	-15	21.64	0	0	0	7.45	900	75.8	69.6	6.13	0	0.9979	997.7	000 00.000	000 00.0000'		
49	23	A36	31/03/2017 9:22	-15	21.64	0	0	0	7.45	900	75.9	69.6	6.13	0	0.9979	997.7	000 00.000	000 00.0000'		

Figure 4c: Sample of comma separated data opened in MS Excel ®

Check Battery (5)

Battery voltage will be always displayed on Main MENU. The warning information will be displayed if the battery needs charging. Note: After plugging in the charger switch ON then switch OFF . The LCD will momentarily flash when charging. If the charger is plugged into the unit without switching ON and OFF it could be up to an hour before it starts charging.

Set Up Menu

Sensor Serial Number (1)

The reader reads the serial number of the probe attached to the 618. If more than one probe is used it identifies the correct probe to be used with the Reader Unit.

Set Clock (2)

The clock uses 24 hour format DD/MM/YYYY HH:MM:SS

From main MENU select R618 Settings->Set Clock and then follow the on screen instructions to set clock.

Average (3)

From main MENU select R618 Settings->Set Average and then follow the on screen instructions to set the average samples.

Set Precision (4)

From main MENU select R618 Settings->Assgn/Confg Sens and then follow the on screen instructions to set precision.

Assign/Del Sensors (5)

From main MENU select R618 Settings->Assgn/Confg Sens and then follow the on screen instructions to assign or delete sensors.

Configure Display (6)

From main MENU select R618 Settings->Assgn/Confg Sens and then follow the on screen instructions to configure display.

Auto Off (7)

To save battery power the 618 will shutdown if no key is pressed after X minutes.

From main MENU select R618 Settings->More Settings and then follow the on screen instructions to set auto off time.

Live Comms(8)

When Data Port is ON, real time data will be displayed on PC at the same time. (PC needs to be paired by bluetooth). Default password is 0000 or 1234

Altitude and Salinity Corrections (9)

The solubility of oxygen in water is less in brackish or sea water than in fresh water and also decreases with increasing altitude. For dissolved oxygen concentration measurements to be accurate, they must be compensated for the salinity of the water being tested and for the atmospheric pressure. The YK618 will calculate the correct value of dissolved oxygen concentration and percent saturation once you have entered the altitude for the particular sample being tested, salinity corrections are made automatically.

From main MENU select R618 Settings->More Settings->Alt Correct and then follow the on screen instructions to set the altitude.

Calibration

Calibration order to ensure the accuracy of the YK618, 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 YK618 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 YK618 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 Electronics Pty Ltd or most major scientific suppliers.

Both dissolved oxygen, conductivity and pH + 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, select **Calibration** in main MENU and press ENT. Select the proper sensor and press ENT again. Then follow the on screen instructions to complete the calibration(s).

The previous calibrated data can be used again for the current calibration if the data is right.

Temperature Calibration

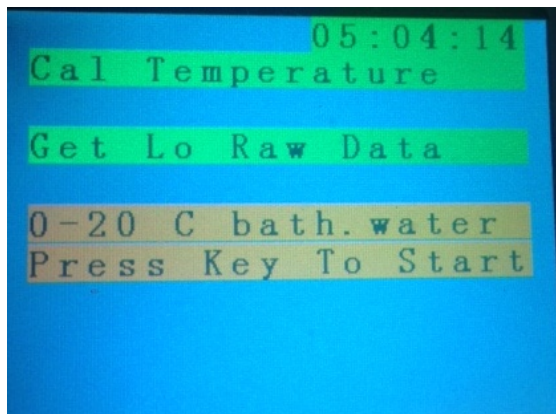
The temperature calibration should vary very little over the lifetime of the instrument however it is worth checking on the accuracy of your temperature measurements before calibrating the dissolved oxygen or salinity sensors.

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. A thermometer to at least 0.1°C accuracy and resolution must be used. To calibrate temperature, proceed as follows:

1. Select TEMPERATURE from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the



ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low temperature range 0-20°C press **ENT** to proceed. Place the probe into stirred water bath.

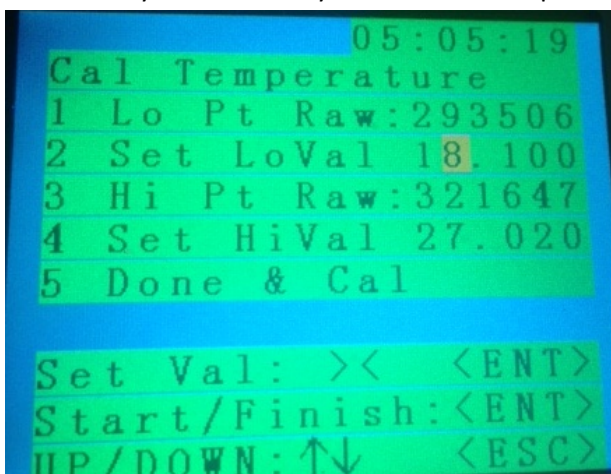


After pressing **ENT**, Raw Data from the temperature sensor will appear, wait until the

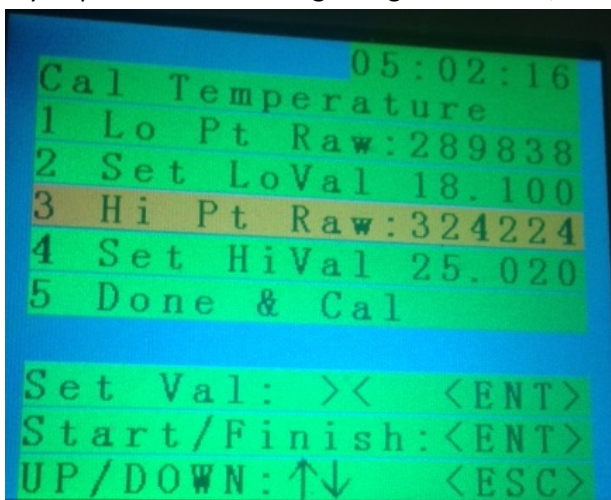


readings are stable and make a note of the reading on the calibration thermometer and press **ENT**.

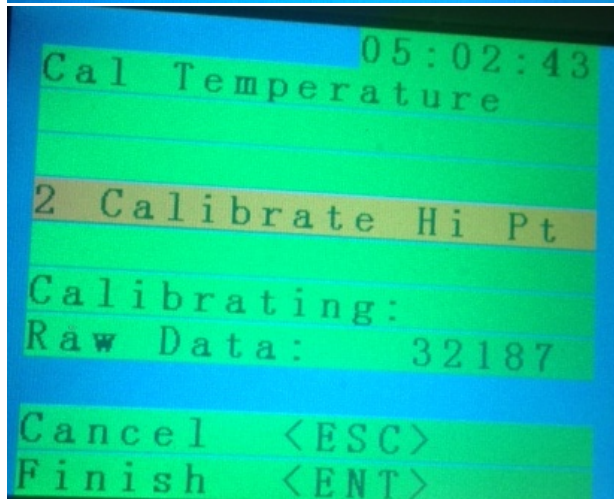
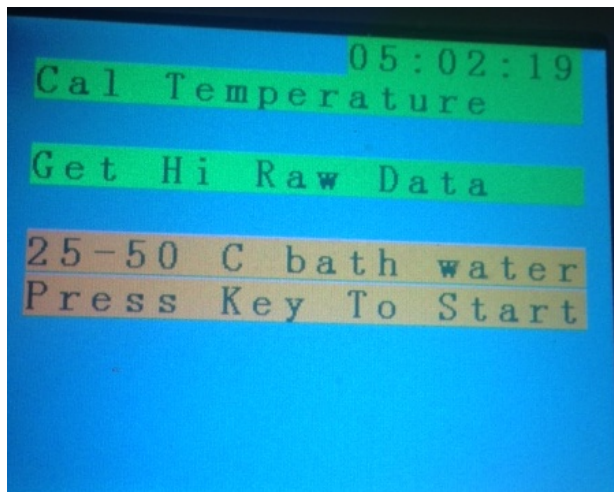
2. Use ENT key and arrow keys to **Set LoVal** temperature.



3. If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and



press **ENT**. The message place probe into 25- 50°C water bath. Press **ENT**, the raw data is



displayed. Immerse the probe in a stirred water bath held at a constant temperature between 25 and 50 C and wait for the probe to reach a constant temperature. Make a note of the temperature on the calibration thermometer and press ENT.

4. Use Ent key and arrow key to **Set HiVal** temperature value.



5. Select **Done & Cal**. Press ENT.



6. The temperature calibration is now complete.

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. To calibrate the sensor, proceed as follows:

1. First, ensure that the temperature sensor is reading accurately and, if necessary, perform the temperature calibration described previously.
2. Select salinity from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low salinity 0 press **ENT** to proceed. Place the probe in air. After pressing **ENT**, Raw Data from the salinity sensor will appear, wait until the readings are stable and press **ENT**.
3. Use ENT key and arrow keys to **Set LoVal0**.
4. If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe in a solution with a salinity of 30-40 ppt, Press **ENT**, the raw data is displayed. Immerse the probe in the solution held at a constant salinity between 30-40 ppt and wait for the probe to reach a constant salinity. Make a note of the salinity and press ENT.
5. Use Ent key and arrow keys to **Set HiVal** salinity value.
6. Select **Done & Cal**. Press ENT.
7. The salinity calibration is now complete.

Low Conductivity calibration

- 1 Select **Cal Cond us/cm** from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low conductivity 0 and press **ENT** to proceed. Place the probe in air. After pressing **ENT**, Raw

Data from the low conductivity sensor will appear, wait until the readings are stable and press **ENT**.

- 2 Use ENT key and arrow keys to **Set LoVal0**.
- 3 If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe in in a KCl solution. To prepare the solution, dissolve 0.7459 grams anhydrous KCl in distilled water and make up the solution to 1 litre. This has an electrical conductivity of 1413 umhos/cm. wait until the readings are stable and press **ENT**.
- 4 Use Ent key and arrow keys to **Set HiVal 1413**.
- 5 Select **Done & Cal**. Press ENT.
- 6 The low conductivity calibration is now complete.

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.

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. Alternatively an optional zero dummy probe may be used to obtain a zero point. 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. When you have the calibration standards ready, perform the following steps:

- 1 First, ensure that the temperature sensor is reading accurately and, if necessary, perform the temperature calibration described previously.
- 2 Select D.O. from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low dissolved oxygen and press **ENT** to proceed. Place the probe in 0% oxygen solution. After pressing **ENT**, Raw Data from the dissolved oxygen sensor will appear, wait until the readings are stable and press **ENT**.
- 3 Use ENT key and arrow keys to **Set LoVal 0**.
- 4 If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe in a solution with a dissolved oxygen of 100% oxygen solution, Press **ENT**, the raw data is displayed. Immerse the probe in the solution held at a constant 100% oxygen solution and wait for the probe to reach a constant dissolved oxygen.

- 5 Use Ent key and arrow keys to **Set HiVal** dissolved oxygen value 100.
- 6 Select **Done & Cal.** Press ENT.
- 7 The dissolved oxygen calibration is now complete.

pH Calibration

The pH sensor is calibrated using buffer solutions with a pH of 3 – 9.0 and 6-12. If the probe is fitted with a refillable pH sensor, it is good practice to refill prior to calibration (see **pH/ORP Sensor Maintenance**). To calibrate the pH sensor, proceed as follows:

1. First, ensure that the temperature sensor is reading accurately and, if necessary, perform the temperature calibration described previously.
2. Select pH from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low pH range desired pH between 3 and 9 press **ENT** to proceed. Place the probe in a solution of the desired pH between 3 and 9. After pressing **ENT**, Raw Data from the pH sensor will appear, wait until the readings are stable and press **ENT**. Make a note of the pH and press ENT.
3. Use ENT key and arrow keys to **Set LoVal** pH.
4. If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe in a buffer solution with pH between 6.0 and 12.0. Press **ENT**, the raw data is displayed. Immerse the probe in a buffer solution with pH between 6.0 and 12.0 and wait for the probe to reach a constant pH. Make a note of the pH and press ENT.
5. Use Ent key and arrow keys to **Set HiVal** pH value.
6. Select **Done & Cal.** Press ENT.
7. The pH calibration is now complete.

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. Perform the calibration as follows:

1. Select ORP from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low ORP range 295.2 mV solution and press **ENT** to proceed. Place the probe in 295.2 mV solution. After pressing

ENT, Raw Data from the ORP sensor will appear, wait until the readings are stable and press **ENT**.

2. Use ENT key and arrow keys to **Set LoVal** ORP 295.2.
3. If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe in solution 472.2 mV solution. Press **ENT**, the raw data is displayed. Immerse the probe in a stirred water bath held at a constant ORP between 25 and 50 C and wait for the probe to reach a constant ORP.
4. Use Ent key and arrow keys to **Set HiVal** ORP value 472.2.
5. Select **Done & Cal**. Press ENT.
6. The ORP calibration is now complete.

Turbidity Calibration

The turbidity sensor is calibrated using solutions with a turbidity of 0 ntu (distilled water) and a high value between 100 –600NTU. 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. To calibrate the turbidity sensor, proceed as follows:

1. Select Turbidity from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low turbidity range press **ENT** to proceed. Place the probe in distilled water. After pressing **ENT**, Raw Data from the turbidity sensor will appear, wait until the readings are stable and press **ENT**.
2. Use ENT key and arrow keys to **Set LoVal** turbidity 0.
3. If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe in solution with turbidity between 100 and 600ntu's. Press **ENT**, the raw data is displayed. Immerse the probe in solution with turbidity between 100 and 600ntu's and wait for the probe to reach a constant turbidity. Make a note of the turbidity and press ENT.
4. Use Ent keyand arrow keysto **Set HiVal** turbidity value.
5. Select **Done & Cal**. Press ENT.
6. The turbidity calibration is now complete.

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.

1. Select Depth from the **Calibration.Lo Pt Raw** or **Hi Pt Raw** will appear. Press the ARROW keys to **Lo Pt Raw** to make the selection then press **ENT** to calibrate the low depth range 0 and press **ENT** to proceed. Place the probe just above the water. After pressing **ENT**, Raw Data from the depth sensor will appear, wait until the readings are stable and press **ENT**.
2. Use ENT key and arrow keys to **Set LoVal** depth 0.
3. If you proceed with the high range calibration, Select **Hi Pt Raw** by using the arrow keys and press ENT. The message place probe into the water. Press **ENT**, the raw data is displayed. Immerse the probe to your pre measured depth and make sure that the cable is vertical. and wait for the probe to reach a constant depth. Make a note of the depth and press ENT.
4. Use Ent key and arrow keys to **Set HiVal** depth value.
5. Select **Done & Cal**. Press ENT.
6. The depth calibration is now complete.

Internal Bluetooth and GPS

The 618 reader unit has been fitted with internal Bluetooth and GPS.

Bluetooth

This method can be used to communicate to a PC. Calibration, real time and logged data can be transmitted from the 618 to the PC and calibration constants from the PC to the 618.

To use Bluetooth communication a Bluetooth enabled PC is required.

One off Pairing:

1. Power on PC and ensure PC Bluetooth is activated
2. Power on 618 reader unit
3. On PC, search for Bluetooth devices – The device name is YK618_### where ### is the serial number.
4. Pair Bluetooth device using pass code 0000 or 1234

Once paired it is possible to access the allocated Bluetooth serial port by the YK Quick Terminal software. For the specific communication port allocated by Bluetooth please check your Bluetooth documentation.

It is generally possible to find the serial port assigned by going to the properties of the Bluetooth device and locating services.

As the communication port can be handled differently by different computers. On some computers the communication port will need to be re-established if the 618 reader unit is powered down and up again – this is possible by pressing the Open/Close Port button in the software. If the reader unit is powered off, it is not possible to communicate with Bluetooth on the 618.

GPS

GPS co-ordinates appear on page 3 of the reader unit. They appear on screen, in stored data and the first data when arm the logging.

The first time the GPS is used or if the GPS has not been used for a while it may take up to 5 minutes for the satellites to lock in. On subsequent uses the GPS is quicker to get a lock and position.

Bluetooth and GPS Power

The reader unit by default activates power to these devices upon reset. Follow reset procedure if power to these deactivates for any reason.

Maintenance

Reader Unit Maintenance

The Reader Unit requires little maintenance except to charge the batteries as necessary and the connectors are kept clean and dry. When the voltage from the battery pack falls below 11.8 volts, the Reader Unit will display the warning message on the LCD display. If the unit is not recharged the voltage will still drop and the instrument will then automatically shut down, although any data stored in the memory will be retained. When this occurs, the only way to restart the instrument is to recharge the batteries. Ensure that the connector caps are secured onto any connectors which are not in use.

Battery Replacement

The model 618 batteries are a battery pack and not user changeable. Contact Yeo-Kal Electronics.

D.O. Sensor Maintenance

To maintain the performance and accuracy of the dissolved oxygen sensor, the membrane should

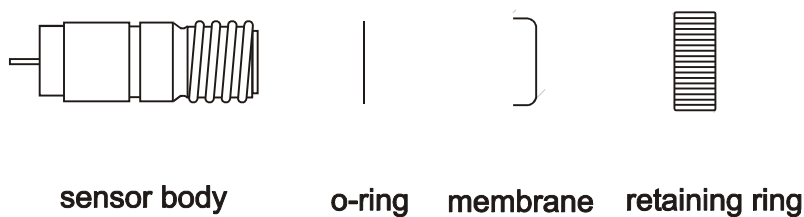


Figure 5: Exploded view of dissolved oxygen sensor.

also be replaced if it becomes damaged or contaminated with organic matter.

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 a flat screw driver, 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.

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.

pH/ORP Sensor Maintenance

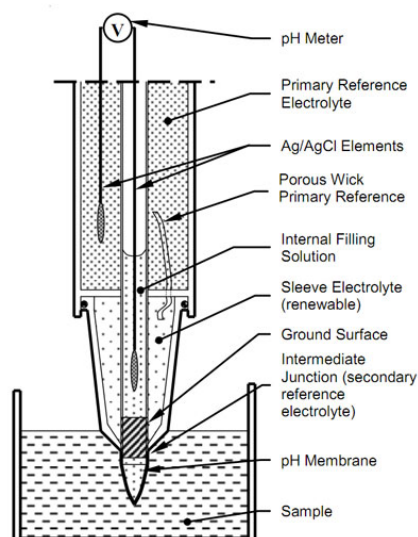
PH/ORP Sensors

The pH and oxidation reduction potential (ORP) are measured using separate pH sensor and bare metal platinum electrode for ORP. They both share an internal reference electrode in the pH sensor.

pH - Standard non-fill able: These pH sensors require the least maintenance, only to be stored clean 3 MOL KCL. Their design is a double junction type to protect the primary junction from dilution and contamination.

pH - Optional refillable: These optional pH sensors have a refillable secondary junction for sensor maintenance. As the electrolyte has a higher flow it requires regular electrolyte top up and calibration. This type of sensor is faster in responding and helps combat accumulation of internal contamination.

It is important to not get a single drop of water on the back of the ph sensor socket or in the ph socket on the probe. Even finger prints on the back of the ph sensor socket can affect ph values and stability. Inspect and ensure these critical areas are wiped clean and dry before assembly.



Carefully and firmly pull the transparent forked junction from the dark grey barrel. It may help to twist the transparent forked junction to loosen the o-ring seal while pulling out.

Attach supplied needle to pH gel electrolyte and aim needle to the bottom of the gap between glass centre and dark grey barrel. The objective is to displace the old electrolyte gel with the new. It may be easier to flush the old gel and contaminants out with warm water or by using a wash bottle with the aid of a paper towel.

When re-gelling is complete, reattach the transparent forked junction and slowly push into the dark grey barrel till it will not go any more. As it is pushed, excess gel will be forced up between the glass centre and the transparent forked junction.

Note: Once the sensor has been serviced the pH sensor will need to be calibrated.

Warning: Abrasive damage (including scratches) to the pH glass will reduce the sensor performance.

The above maintenance procedure is recommended prior to calibration. Follow the 2 point calibration procedure for your water quality analyser. In some circumstances it is feasible to calibrate without maintenance. A prolonged period of no maintenance will affect the reference and may cause the centre offset to drift – meaning mid values may read high or low.

Storing

Do not store pH sensor in water as it will deplete the ions.

Do not let the pH sensor dry up.

Always rinse of contaminants and store clean.

Ensure there is some pH probe keeper in the protector cap before replacing on the pH sensor.

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.

The model 618 comes with a black acetyl screen. This is inserted into the glass tube to reduce stray infra-red from causing errors in clear water. At the end of the tube are two holes/slots (apertures) that allow the infra-red light source to pass which is then detected at 90 deg to the source. Mud and residue can accumulate and the holes/slots may become blocked and obscure the light source affecting the value. They can be cleaned by either using a small bottle brush or remove the screen to clean it.

Remove the screen by unscrewing two retaining screws at the bottom of the probe, situated on the flange. Pull the tube out and wash it and also clean the glass tube. Reinsert the screen and do up the two retaining screws.

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 connector pins aligned. Align the sensor and push it into the probe assembly. Be sure to recalibrate the salinity and low conductivity.

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

- If the YK618 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. 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. **DO NOT UNSCREW THE CAP, (SLIDE THE CAP OFF)** The glass sensor is EXTREMELY DELICATE and should not be bumped or touched.

- The YK618 comes with a storage canister which clamps onto the probe providing a waterproof seal. To maintain enough moisture add 2-5mL of water to keep the pH sensor from drying out.

Appendix 1 - Conversions Used

The YK618 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 Analysers, 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.

Appendix 2 - Part Numbers

Part Number	Description
YK618-001	Probe assembly
YK618-002	Cable assembly
YK618-003	Dissolved oxygen sensor
YK618-004	pH/ORP sensor
YK618-005	Conductivity sensor
YK618-006	Depth sensor
YK618-007	Dissolved oxygen membrane
YK618-008	Dissolved oxygen O-ring
YK618-009	Dissolved oxygen membrane retaining ring
YK618-010	Dissolved oxygen electrolyte
YK618-012	Platinising solution
YK618-013	Sensor storage solution
YK618-014	pH buffer 4.0 1 litre
YK618-015	pH buffer 10.0 1 litre
YK618-016	Salinity standard 35.00 ppt 1 litre
YK618-017	Formazin solution 1 litre
YK618-018	Battery pack
YK618-019	Battery pack c/w batteries
YK618-020	Front panel membrane
YK618-021	Circuit board
YK618-022	Communications cable
YK618-023	Auxiliary 12V supply cable
YK618-024	Auxiliary 12V Bulk head connector
YK618-025	Communications bulk head connector
YK618-026	Sensor bulk head connector
YK618-027	YEO-KALGraph graphics software