Model 606+ Multi-Parameter Logger with CTD

Section 1 - Mechanical Operation

CHAPTER DESCRIPTION PAGE

1 INTRODUCTION

This section of the manual describes the specification, construction, wiring diagrams and basic maintenance procedures of the Valeport Model 606+ Multi-Parameter Logger with CTD.

As standard, the Model 606+ system consists of the following components:

- Titanium housed instrument with bulkhead mounted sensors
- Stainless steel deployment cage
- 3m Y lead (interface to PC)
- Switching Plug
- Basic maintenance tools and spare o-rings
- DataLog 400 Software
- Operating Manual
- Transit case

In addition, the following components may be supplied as optional extras:

- Additional remote sensors with interface cables
- RS485 communications adaptor
- RS422 communications adaptor
- FSK modem communications adaptor (includes pcb in instrument)
- Various lengths & types of signal cable are also available

Please refer to Section 2 of this manual for details of software operation.

2 SPECIFICATIONS

2.1 SENSOR SPECIFICATIONS

The unit is fitted with the following sensors as standard:

Conductivity

Type: Pressure balanced inductive coils
Range: 0.1 to 80 mS/cm
Accuracy: ± 0.01mS/cm
Resolution: 0.004mS/cm

Pressure

Type: Strain Gauge
Range: 20Bar absolute (approx 200m water depth) standard. Others available.
Accuracy: ± 0.1% Full scale
Resolution: 0.0050% Full scale

Temperature

Type: Fast response PRT
Range: -5 to +35°C
Accuracy: ± 0.01°C
Resolution: 0.002°C

The following sensors may be optionally fitted.

	Turbidity	DO	pH	Redox (ORP)	PAR
Type:	Seapoint	Oxyguard	Pressure Balanced Electrode	Pressure Balanced Electrode	Licor
Range:	0 to 2000 FTU (max)	0 to 200%	2 to 12	0 to 1000mV	0 – 10000 mmol/s/m²
Accuracy:	± <2% to 750 FTU	± 1% of measured value	± 0.1	± 0.1mV	±5% absolute
Resolution:	0.005% FS	0.005% sat	0.001	0.01	0.1µmol/s/m²

Note that all these sensors give an analogue output signal (either volts or amps) as standard – the accurate measurement of this signal is the function of the primary sensor calibration, which is given in the calibration section of this manual. This primary calibration has a high level of long-term stability, and should not need to be rechecked any more often than the conductivity, temperature or pressure sensors – typically every one or two years depending on the customer's own requirements.

However, this primary data output may be subjected to a secondary, or "User" calibration within the instrument, so that the output is converted into engineering units, for example mg/l or %sat. Details of how to perform these User calibrations are given in the software section of the manual.

2.2 MECHANICAL SPECIFICATIONS

Materials

Housing: Titanium

Exceptions: Conductivity Cell, DO Sensor, Turbidity Sensor and pH Sensor use Acetal. Temperature Sensor uses Stainless Steel (316 grade). Redox and pH use glass electrodes.

Cage: Stainless steel (316 grade) with polypropylene clamping brackets

Dimensions: Instrument - 88mm Ø, 665mm long (including connector)
Cage – 750mm long x 140mm x 120mm

Weight (in cage): 15kg (air), 8.5kg (water)

Depth Rating: 5000m (unless smaller pressure sensor fitted)

Connectors

Instrument: 10 pin female Subconn bulkhead type with lock ring, data and power

Comms Cable: Valeport 3m Y lead. 10 pin male Subconn line type to instrument, 2 x 4mm banana plugs to external power, 9 pin female D type to PC.

Switching Plug: 10 pin male Subconn line type, with lock ring. Note that the switch cap contains wiring links to activate the instrument – it is not a dummy plug.

2.3 PERFORMANCE SPECIFICATIONS

Memory: 8Mbyte solid state memory (upgradeable in 8 Mbyte steps to 32 Mbyte).

Internal Power: 8 x 1.5V alkaline D cells. The unit will accept 8 x 3.6V Lithium D cells with no alterations required. Do not mix battery types.

External Power: Between 8 and 30V DC.

Current Drain: Depends on sensors fitted. CTD only uses 50mA at 12V when running, and 0.25mA when in sleep mode.

Sampling Rate: 1, 2, 4 or 8Hz (synchronised).

Data Output: RS232, RS485 or RS422, depending on pin selection. Baud rate is user selectable from 2400 to 115200.

2.4 SAMPLE LIFETIME CALCULATIONS

2.4.1 BASED ON MEMORY

Lifetime based on memory is simple to calculate. Conductivity, Temperature, Pressure, Turbidity, DO and pH values use 2 bytes of memory per sample. Therefore total memory used per record is (6 x 2) = 12 bytes. Note that in Trip mode, each record is also assigned a date/time stamp, which uses a further 7 bytes.

The 8 Mbyte memory actually contains 8,388,608 bytes. Allowing a small amount of memory usage for header files, the memory will store over 430,000 records in Trip sampling mode, and over 1 million records in all other modes.

The length of time that this will last for obviously depends on sampling scenario. Here are three examples:

Continuous data sampling, 8Hz:

Memory used per second is 8 x 12 bytes = 96 bytes.

Total memory fitted is 8,388,608 bytes.

Number of seconds before memory full is 8,388,608 / 96 = (approx) 87,381 seconds.

This is equivalent to 24 hours.

This period can be doubled by sampling at 4Hz.

Burst sampling, 4Hz, sampling for 1 minute every 10 minutes, recording all data points:

Memory used per burst is 12 bytes x 4Hz x 60 seconds = 2880 bytes.

The memory will therefore be full after 8,388,608 / 2880 bytes = 2912 bursts. At a 10 minute cycle time, this is 29120 minutes, which is equivalent to 20 days.

Trip sampling, 5000m cast, measuring every 1 metre:

In this example, the instrument will take 1 reading every metre of both descent and ascent. This means 5000 data points descending, and a further 5000 ascending. Each record consists of 12 bytes of data and 7 bytes of time stamp. Each record therefore uses 19 bytes. A single cast will take 10,000 such records, and will therefore use 190,000 bytes.

The 8Mbyte memory will therefore hold approximately 44 casts of data.

2.4.2 BASED ON BATTERIES

The Model 606+ will function with a voltage supply of between 9 and 30VDC. The voltage output of the 8 x D cell battery pack will vary according to the type of cell fitted. The most likely cells to be used will be standard alkaline type (1.5V each) or Lithium cells (3.6V each), giving a 12V nominal output for alkaline cells, or 28.8V nominal for Lithium cells. The following calculations are based on the same sampling scenarios as the memory calculations, using figures for a 12V alkaline battery pack. Each example also gives a figure for a Lithium battery pack, calculated from a basic ratio of alkaline to Lithium performance.

In all examples, it is taken that an 8 D cell alkaline battery pack will have a nominal capacity of 14Ah, and will be 75% efficient (total available charge, 10.5Ah), and that an 8 D cell Lithium pack will have a nominal capacity of 17.5Ah, and will be 95% efficient (total available charge, 16.6Ah).

Continuous data sampling, 8Hz:

At 12V, the instrument will draw approximately 60mA when sampling, with DO, pH and turbidity sensors fitted.

Total charge available is 10500mAh.

Number of hours available is therefore 10500mAh / 60mA = 175 hours.

This is equivalent to just over 7 days.

For Lithium cells, a similar calculation gives over 27 days.

Note that the instrument is effectively operating continuously when in Trip sampling mode, so similar calculations will apply.

Burst sampling, 4Hz, sampling for 1 minute every 10 minutes:

At 12V, instrument draws 60mA when sampling, plus 60mA for 5 seconds at the start of each burst. It draws 0.25mA when in sleep mode between bursts.

In this scenario then, the instrument will draw 60mA for 65 seconds, and then 0.25ms for 535 seconds. On average, it will draw:

$$\frac{(60 * 65) + (0.25 * 535)}{(65 + 535)} = 6.72\text{mA}$$

Total charge available is 10500mAh.

Number of hours available is therefore 10500mAh / 6.72mA = 1562 hours.

This is equivalent to approx 65 days.

For Lithium cells, a similar calculation gives approx 156 days.

Note that the above examples are intended as guides only. Valeport accepts no responsibility for variation in actual performance. Note that performance of individual battery cells is not always consistent.

3 INSTALLATION

The standard system is supplied in an ABS transit case, together with any communications adaptors ordered. Any additional lengths of signal cable are packed separately.

3.1 COMMUNICATIONS WITH PC

The Model 606+ can be set up and interrogated using the DataLog 400 software supplied. Please refer to Section 2 of this manual for details of how to use the software.

To connect the instrument directly to a PC for RS232 communications, use the 3m Y lead supplied. This lead is fitted with a 10 pin Subconn type connector, which should be plugged directly into the connector on the top of the housing (or to a length of signal cable). The lead also features 2 x 4mm banana plugs for application of external power if required and a 9 way D type connector which should plug directly into a spare comm port on the back of the PC. Note that a 9 - 25 way adaptor may be required, depending on PC configuration.

If non-RS232 communications are to be used, via the optional RS485, RS422 or FSK methods, then the appropriate adaptor should be used. Each adaptor is supplied with a switched 3m Y lead (different to the standard RS232 Y lead), which should be connected as follows:

Comms Method	Adaptor Part no.	Connections
RS485	0400029	Connect 15 pin D type and 4mm plugs from Y lead into adaptor. Connect 9 pin D type from adaptor to PC, and 4mm plugs from adaptor to external power, as indicated on adaptor housing.
RS422	0400030	Connect 15 pin D type and 4mm plugs from Y lead into adaptor. Connect 9 pin D type from adaptor to PC, and 4mm plugs from adaptor to external power, as indicated on adaptor housing.
FSK	0400005	Connect 4mm plugs from Y lead into adaptor, leaving D types unconnected (FSK uses power and signal on just two wires). Connect 9 pin D type from adaptor to PC, and 4mm plugs from adaptor to external power, as indicated on adaptor

3.2 DEPLOYING THE MODEL 606+ MULTI-PARAMETER LOGGER WITH CTD

All parts of the standard system (with the exception of the top part of the 3m Y lead) are designed for immersion. All communications adaptors (RS485, RS422, FSK) are splash proof, but should be sited in a dry place, as close to the PC as possible.

The Model 606+ is supplied with a stainless steel protective cage, but care should still be taken not to damage the instrument. For profiling work, the recommended deployment method is to suspend the instrument using the stainless steel wire strop. For fixed deployments, the user may wish to remove the steel cage, and use the grooves in the titanium instrument housing as clamping points.

3.2.1 REAL TIME OPERATION

For real time data output, connect the signal cable to the 10 pin Subconn connector on the instrument. All Valeport signal cables include a suspension point for strain relief, and a similar arrangement is recommended for other cable types. Connect the top end of the cable to a PC using the appropriate method as described above.

3.2.2 SELF RECORDING OPERATION

For self recording only deployments, the instrument is switched on by insertion of the Subconn style switch plug. This plug must be inserted for the unit to operate.

3.3 RECOVERY

On recovery, data can be extracted to PC via the 3m Y lead. This is covered in Section 2.

To prolong the lifetime of the instrument the following procedures should be carried out once the instrument has been recovered:

- Remove any significant growth from the instrument, taking care not to damage any of the sensor faces. A high pressure water jet or stiff (not metal) brush is recommended.
- Remove any significant growth from the pressure sensor port. Take care not to introduce any sharp objects onto the sensor face – this may result in sensor damage.
- Check instrument for signs of damage.
- Rinse the instrument in fresh water
- Dry the instrument if possible, paying particular attention to the sensors and connector.
- Repack the instrument in the transit cases provided.

4 MAINTENANCE

The Model 606+ Multi-Parameter Logger with CTD is completely solid state, and therefore requires very little maintenance. Other than keeping the instrument relatively clean, the only procedure that the customer will be required to carry out on a regular basis is to change the batteries. This Chapter also covers details of the o-rings that are fitted to the instrument, and which should be checked regularly for damage and replaced if necessary.

4.1 CHANGING BATTERIES

The Model 606+ Multi-Parameter Logger with CTD accepts 8 x D cells, of either 1.5V alkaline or 3.6V Lithium type. These cells are arranged in series, so the output voltage is 12V (alkaline) or 28.8V (Lithium). Some example scenarios for lifetime of these batteries are given in Chapter 2.4.2.

The batteries are located in a holder in the top of the instrument, and should be accessed by removing the connector bulkhead.

1. Remove the instrument from the protective cage by loosening the M10 nuts on the polypropylene clamps. Gently lever these clamps apart, using a screwdriver if necessary.

2. Slide the instrument out of the cage, in either direction.

3. Remove the 3 M5 x 20 socket cap screws in the connector bulkhead, using the Allen key provided. Note that these screws are titanium, and should be replaced with titanium screws if lost. Other materials will suffer galvanic corrosion and may be destroyed.

4. Without twisting or putting undue stress on the Subconn connector slide the bulkhead and attached battery pack out of the main housing. A slot between the tube and the bulkhead allows levering with a screwdriver if necessary. Take care not to scratch the bore of the tube.

5. A lead connects the battery pack to the electronics inside the tube. This may be disconnected at the battery pack if required, for ease.

6. Replace the batteries.

7. Check the condition of the bore seal o-rings, and apply a light coating of silicon grease. Ensure that both they and the anti-extrusion rings sit in the groove correctly, and are free from damage.

8. Reattach the connector to the electronics if necessary, and gently slide the battery pack back into the tube, ensuring that the fixing holes are correctly aligned. Again, take care not to scratch the bore.

9. Replace the 3 x M5 titanium screws, using a small amount of copper grease (supplied). Do not force the screws, just tighten firmly.

10. Finally, slide the instrument back into the protective cage. Note that the clamping brackets are offset, and that the sensor end of the instrument should lie at the long end of the cage.

4.2 O-RING SIZES

The Model 606+ Multi-Parameter Logger with CTD is kept watertight by using o-ring seals. Double o-ring seals are used at each end of the titanium housing, although the customer should have no reason to open any seal other than that at the battery end. To help preserve the watertight nature of the equipment, please observe the following guidelines:

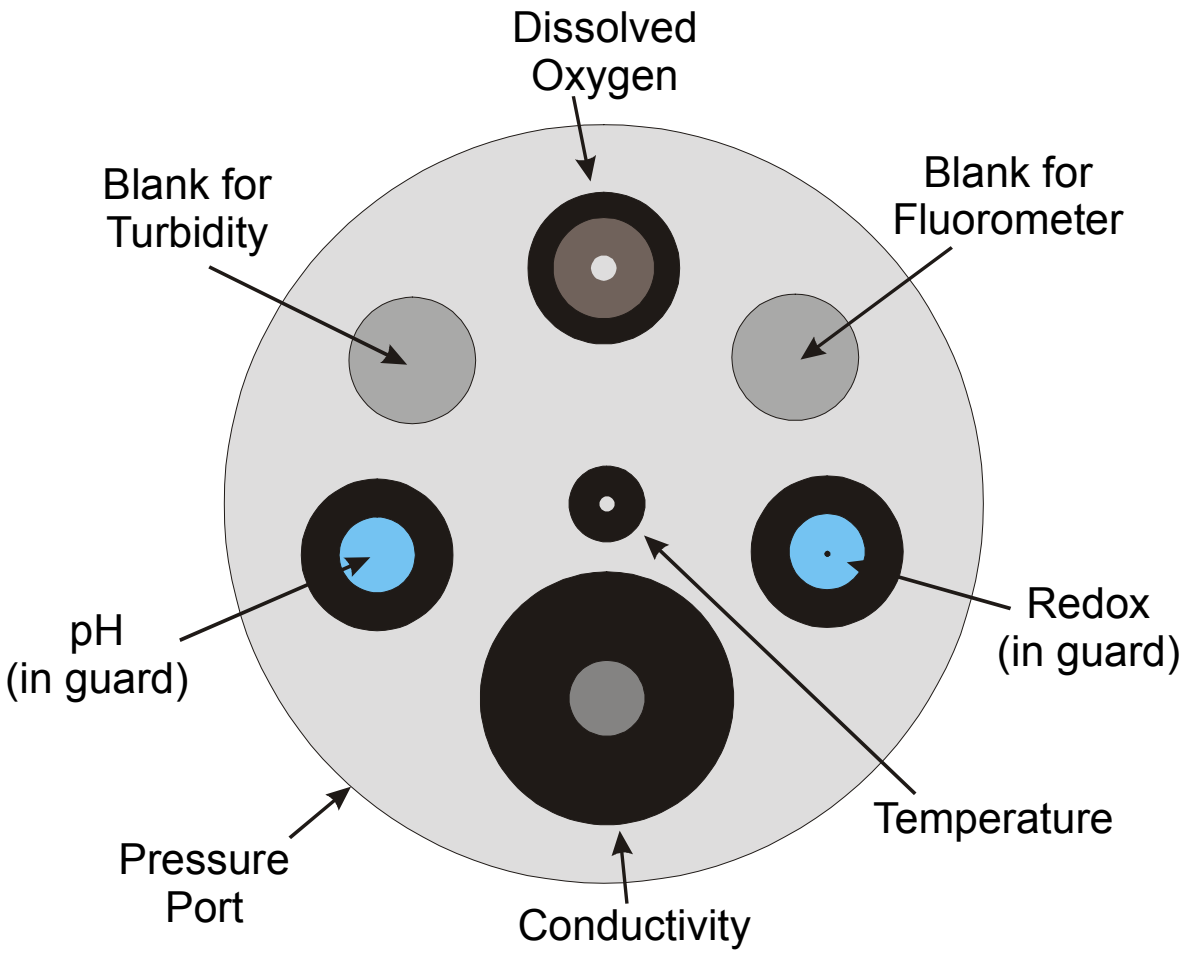
- Ensure that all o-rings are free from cuts, abrasions or perishing.
- Ensure that all-o-rings are free from dirt, grit, sand, hair and other foreign objects.
- Ensure that an anti-extrusion ring is fitted on the pressure side of each o-ring. With the concave surface towards the o-ring.
- Whenever an o-ring seal is opened (e.g. when changing batteries), ensure that a light coating of silicon grease is applied to the o-ring before the seal is closed.
- Ensure that all o-ring protected seals are tightened.

A set of spare o-rings and anti-extrusion rings is included with the equipment. If an o-ring needs replacing, be sure to use the correct size. If obtaining further spare o-rings from an alternative source, be sure to obtain the correct material (signified by the last 4 digits of the o-ring code number).

O-ring size:	200-158-4470
Anti-extrusion ring size:	158

5 SENSOR INFORMATION

The view onto the end of a fully specified Model 606+ is as below. Note that not all sensors may be fitted to a specific unit.



Notes:

Redox, pH and Temperature sensors are protected by plastic guards. These guards may be unscrewed for cleaning or calibration purposes, but should be replaced prior to deployment.

The pH and Redox sensors are fitted with a protective rubber cap, which is used to prevent the sensor from drying out. A small amount of reference solution should be put into the cap before it is fitted for storage.

The pH and Redox sensors are filled with an electrolyte via a small hole in the side of the glass tube. This hole is sealed with a rubber ring, which should only be moved if the sensors are being refreshed.

The Dissolved Oxygen sensor is fitted with a protective plastic cap, which should be removed prior to deployment. Note also that this cap contains a small sponge, which should be kept moist with reference solution during instrument storage.

5.1 OXYGUARD D.O. PROFILE

5.1.1 PROBE DESCRIPTION

The OxyGuard Profile is a small dissolved oxygen probe with a very fast reponse time and a short temperature equilibrium time. It is designed specially for profiling measurements in ponds, lakes and the sea. It is (unlike other types of dissolved oxygen probe) NOT sensitive to hydrogen sulphide!

The measurement process in standard dissolved oxygen probes is such that the whole probe must attain temperature equilibrium with the surroundings before correct measurements are obtained. The OxyGuard Profile overcomes this problem – it measures correctly immediately thanks to its innovative and technologically advanced design!

As with all OxyGuard dissolved oxygen probes, the Profile has built-in temperature compensation. It delivers a millivolt output directly proportional to the oxygen pressure that it senses. The electronics needed to process the probe output can therefore be very simple!

The OxyGuard Profile is delivered with a M18 x 1mm thread mount and 50cm leads as illustrated, but can be delivered in other configurations on request.

5.1.2 PROBE CARE

The OxyGuard profile will give you many years of trouble-free service if you treat it with a little care. The membrane should be kept clean, and the wooden insert must not be allowed to dry out. Check that the sponge in the protection cap is wet every time you use the probe, and if you store it for any length of time check that the sponge is wet at regular intervals.
Calibrate the probe as needed - once a day should be more than enough. Renovate the probe if you cannot calibrate to the correct value.

5.1.3 PROBE CALIBRATION

The Probe should be calibrated in water-saturated air, or in air-saturated water. We recommend the following procedure:

1) Unscrew the protection cap and remove the sponge.

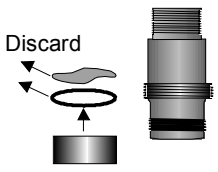
2) Wipe the membrane - it should be clean and dry.

3) Put a few drops of water into the protection cap and lightly screw it in place.

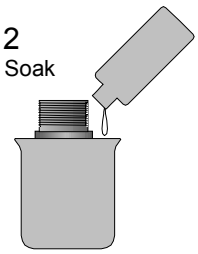
4) Adjust the electronics connected to give the calibration value corresponding to 100% saturation.

5.1.4 PROBE RENOVATION

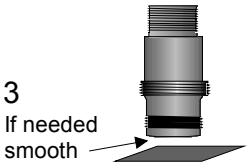
1. Clean the outside of the probe. Unscrew the membrane cap, discard the used membrane and O-ring.
   Clean and dry the cap.



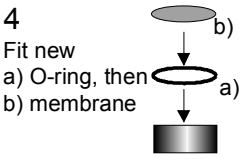
2. Soak the probe end in electrolyte - how long depends on how long ago it was last soaked.



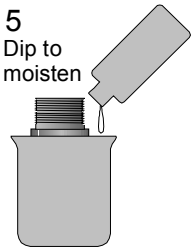
3. Inspect the cathode face. If the wooden insert has lifted above the cathode or edge wet the grade 300 wet-or-dry emery paper delivered with the probe with electrolyte and use it to smooth the insert down until no edges can be felt.



4. Put a new O-ring in place in the bottom of the cap and place a new membrane above it. It is very important that the membrane is placed concentrically in the bottom of the cap above the O-ring.



5. Dip the cathode face in electrolyte.



6. Hold the probe with the cathode face up and gently screw the cap with O-ring and membrane onto it. Tighten the cap firmly. The membrane should not wrinkle, if it does discard it and start again with a new membrane.

7. Renovation is complete. Calibrate the probe. Remember to store with the protector fitted. The sponge in the protector must be kept moist at all times.

5.1.5 SPECIFICATIONS

Output Signal :	Approx 35mV at 100% saturation.
Temperature Compensation:	Built into probe.
Response Time:	Oxygen: 90% within 10 seconds for a 100% step change, same temperature.
	Temperature compensation: approx. 10 seconds per 10°C
Connections:	Delivered with 2 x 50cm 0.25mm2 wires or as ordered.
Accuracy (oxygen):	+/- 1% of measured value.
Accuracy (temperature compensation):	+/- 2% of measured value between 5 and 25°C.
Suitable Amplifier Requirements:	Input Impedence: Minimum 2 megohm.
	Galvanic Isolation: Recommended.

5.2 SEAPOINT TURBIDITY METER

Seapoint Turbidity Meter

User Manual

Bulkhead Version

5.2.1 DIMENSIONS

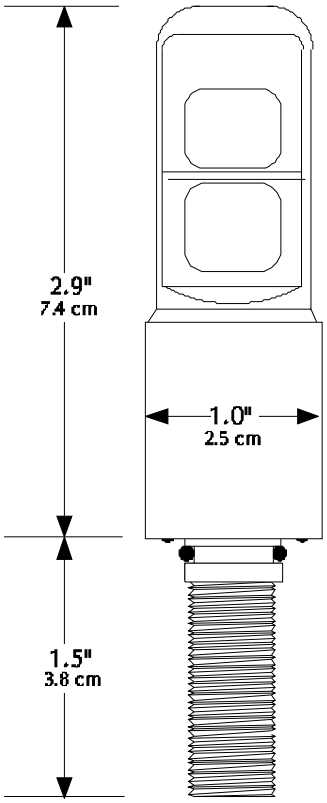


Figure 1. Outline Drawing

5.2.2 SPECIFICATIONS

Power Requirements:	7-20VDC, 3.5mA avg, 6mA pk
Output:	0-5.0 VDC
Output Time Constant:	0.1 sec
RMS Noise:	< 1 mV
Power-up Transient Period:	<1 sec
Light Source Wavelength:	880 nm
Scatterance Angles:	15 - 150 degrees
Linearity:	< 2 % deviation 0-750 FTU
Sensitivity/Range:	
100x gain:	200 mV/FTU 25 FTU
20x gain:	40 mV/FTU 125 FTU
5x gain:	10 mV/FTU 500 FTU
1x gain:	2 mV/FTU (< 750 FTU) *
Temperature Coefficient:	< 0.05 %/°C
Operating Temperature:	0°C to 65°C
Depth Capability:	6000 m (19,700 ft)
Overall Length:	11.2 cm (4.4 in)
Sensor Weight (dry):	95 g (3.3 oz)
Body Diameter:	2.5 cm (1.0 in)

* Response to turbidity levels greater than 750 FTU is nonlinear

5.2.3 INTRODUCTION

The Seapoint Turbidity Meter is a sensor that measures turbidity by detecting scattered light from suspended particles in water. Its small size, very low power consumption, high sensitivity, wide dynamic range, and 6000 meter depth capability allow this sensor to be used in most applications where turbidity or suspended particle concentrations are to be measured. The sensor is also insensitive to ambient light when under water and has a very low temperature coefficient.

The Seapoint Turbidity Meter senses scattered light from a small volume within 5 centimeters of the sensor windows. Confining the sensing volume allows the sensor to be calibrated in relatively small water containers without errors from surface and wall reflections. It also allows the sensor to be used in tight spaces such as crowded instrumentation packages, pipes, and shallow streams.

Two control lines allow the user to externally set the sensitivity of the Seapoint Turbidity Meter by choosing one of four gains. This provides an easy means to set the sensitivity to provide the range and resolution required for a particular application.
Sensitivities of 2, 10, 40 and 200 mV/FTU are possible.

Each sensor is factory adjusted for consistent response to Formazin Turbidity Standard measured in Formazin Turbidity Units (FTU). The user may also calibrate the sensor with particles of interest to measure their suspended concentrations.

The Seapoint Turbidity Meter is constructed of rugged, corrosion resistant materials and quality surface mount electronic components for durability and high reliability.

5.2.4 OPTICAL DESIGN

Figure 2 shows a cross-section of the Seapoint Turbidity Meter optics.

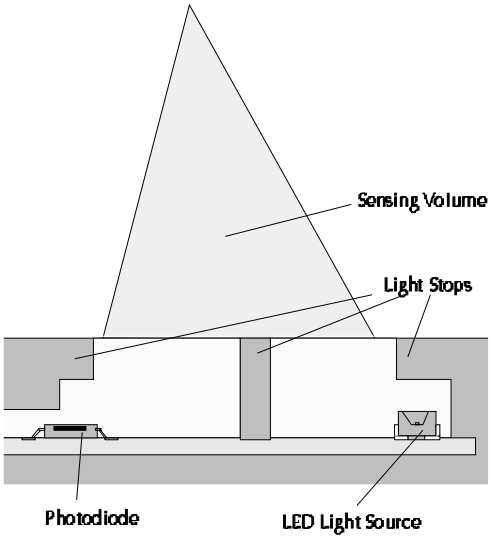


Figure 2. Diagram of Seapoint Turbidity Meter Optics

The light sources are side by side 880 nm Light Emitting Diodes.

The light detectors are side by side silicon photodiodes with visible light blocking filters. The light sources are extremely efficient and well matched to the peak sensitivity of the silicon photodiodes.

The opaque housing forms a light block which prevents light from the emitter from reaching the detector directly. Light from the LEDs shines through the clear epoxy emitter window into the sensing volume where it is scattered by particles.

It is possible for light scattered at angles between 15 and 150 degrees to pass through the detector window and reach the detector. The amount of scattered light that reaches the detector is proportional to the turbidity or particle concentration in the water over a very large range.

The optical design of the Seapoint Turbidity Meter is unique in its restriction of the angle of emission of the light sources and the angle of detection of the light detectors. This confines the sensing volume to within five centimeters of the sensor windows. The advantage to confining the sensing volume to a small space near the sensor is the great reduction of interference from reflections from large objects outside the sensing volume. This allows the sensor to be calibrated in a relatively small water container without interference from surface or wall reflections. It also allows the sensor to be used where limited volumes of water exist for sensing or in the midst of objects which would otherwise cause interfering reflections. Examples include instrumentation packages with limited space between instruments or limited space inside the frame, monitoring water inside pipes, and measuring water in shallow streams or near stream beds.

5.2.5 ELECTRONIC DESIGN

The Seapoint Turbidity Meter has an electronic design that achieves high sensitivity while consuming very little power. Surface mount components are used for high reliability and compact design. Low quiescent current components are used so that most of the power drawn by the sensor is used to drive the light source. Overall power requirements are 7-20 VDC, 3.5 mA average, 6 mA peak.

Optical feedback is incorporated in the light source drive circuitry. This offers several benefits including excellent temperature compensation for the optical components, ompensation for the aging of the optical components, and table output within a second after power up.

The light source is modulated and synchronous detection is used to extract the scatterance signal from the unwanted portion of the signal resulting from ambient light and electronic noise.

Achieving high sensitivity using low power was accomplished by paying careful attention to proper circuit board layout to prevent any stray coupling of signals synchronous with the modulation of the light source into the detection circuitry. The need for offset adjustment was thereby eliminated — the offset voltage for this sensor at any gain is within one millivolt of zero.

5.2.6 OPERATION

The Seapoint Turbidity Meter requires 7 to 20 VDC input and will draw an average of 3.5 mA current with a peak current draw of 6 mA. Output is 0 to 5.0 VDC with a 0.1 second time constant.

Warning: Applying voltages to the output pin or powering the sensor with a voltage greater than 20 V will result in damage to the sensor.

A mechanical drawing for the machined housing and Seapoint Turbidity Meter is shown in Figure 3.

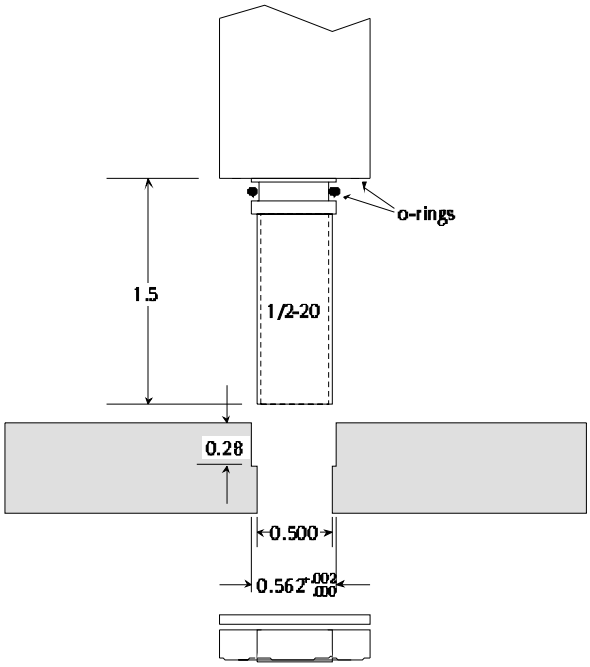


FIGURE 3. DRAWING OF BULKHEAD SENSOR and customer housing.

The bulkhead (connector end of sensor) and the mating machined housing should be cleaned and lubricated with an o-ring lubricant.

Connections for the bulkhead version are as follows:

Brown: Power Ground
Blue: Signal Output
Green: Signal Ground
Yellow: Power In
Orange: Gain Control A
Red: Gain Control B

The two independent gain control lines A and B are used to select one of four possible gain settings (see Table 1). These wires can be hardwired for the desired gain or interfaced with a microprocessor, using 5 volt logic, to allow gain to be controlled through software. Hardwiring the gain does not require an external voltage source. To hardwire a line to +5V, simply leave it open, which allows an internal pull-up to hold it at +5 VDC. To set a line to 0V, tie it to the power ground.

The sensor has a linearity in Formazin of ±2 % at the 100X, 20X, and 5X gain settings. The 1X gain setting is provided for extremely turbid water. The sensor response above 750 FTU is nonlinear; however, the useful range can be extended by calibrating the sensor and fitting the response with a second order polynomial equation. This approach is limited by the

A	B	Gain	Sensitivity	Range
+5 V	+5 V	100X	200mV/FTU	25 FTU
+5 V	0 V	20X	40mV/FTU	125 FTU
0 V	+5 V	5X	10mV/FTU	500 FTU
0 V	0 V	1X	2 mV/FTU	n/a
			(<750 FTU)	

Table 1. Truth Table for Switching Gains

increasingly flat response at turbidity levels approaching 4000 FTU. Figure 4 shows a typical sensor response.

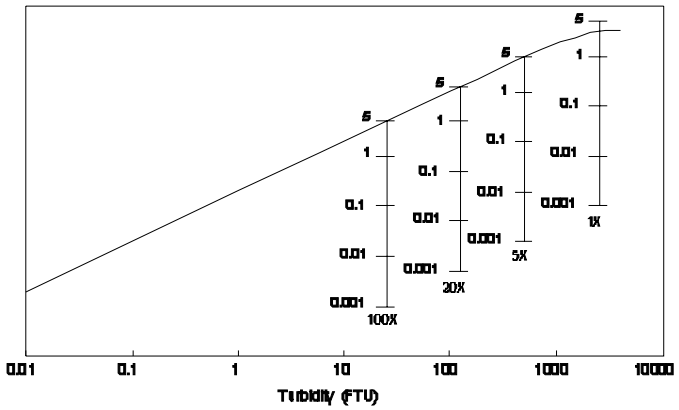


Figure 4. Sensor Response to Formazin

5.2.7 CALIBRATION

All sensors are adjusted to the nominal sensitivities specified so that for most purposes they are interchangeable. If greater accuracy is desired, it is recommended that the user perform calibrations on individual sensors.

The sensors can also be calibrated by the user to measure suspended particle concentrations. Like all optical instruments, this calibration must be performed using a sample from the measurement site. Calibrations with different particle types will
typically yield erroneous results.

Calibrations should be performed periodically at a frequency which depends on the condition of the windows. Although these sensors are electronically stable with time, scratching or fouling of the windows will result in reduced sensitivity. Visual inspection is a good test of whether the sensor needs recalibration: if the windows appear polished and clear when dry, the sensitivity probably has not changed significantly.

When calibrating in a small container, multiple scattering events may reflect off the container walls introducing a small error to the calibration. For this reason, the use of a black container is recommended.

Calibration should be performed under fluorescent lighting. Incandescent lights emit large amounts of energy at the operating wavelength which may interfere with measurements.

5.2.8 CARE

The Seapoint Turbidity Meter is a rugged instrument that should provide years of reliable performance with minimal care.

After using, rinse the sensors and clean the windows with water and mild detergent if necessary (avoid using organic solvents).

If windows become scratched, they may be polished using a cloth buffing wheel with polishing compound.

The connector should be cleaned and lubricated before the sensor is mounted with an o-ring lubricant.

The Seapoint Turbidity Meter contains no user serviceable electronics and must be returned to the factory if it does not operate properly.

5.2.9 LIMITED WARRANTY

Seapoint Sensors, Inc. warrants this Turbidity Meter to be free of defects of materials and workmanship under normal use and service for a period of 1 year from the date of shipment. This warranty extends only to the original purchaser.

In the event the product fails to operate according to our published specifications during the warranty period, Seapoint Sensors, Inc. will repair or replace the instrument at our discretion. If it is determined that the failure was due to other than normal use or service, repairs will be billed and estimate will be submitted prior to repair work.

Shipping costs must be prepaid. Seapoint Sensors, Inc. accepts no responsibility for damage during return shipment.

6 WIRING INFORMATION

6.1 3M Y LEAD (RS232)

10 Way Male Subconn	3m Blue Polyurethane Cable	1m White Cable	4mm Banana Plugs	1m Grey Cable	9 Way D Type	Function
1	WHITE	BLUE	BLACK			Power Ground
2	PINK	BROWN	RED			Power +V
3	N/C					
4	N/C					
5	N/C					
6	N/C					
7	GREY			YELLOW	2	RS232 Tx (To PC)
8	BLUE			BLUE	3	RS232 Rx (From PC)
9	GREEN			GREEN	5 (link to 1,6,8,9)	RS232 Ground
	SCREEN			SCREEN	SHELL	
10	YELLOW					Internal Battery Enable Link to RS232 Ground

6.2 3M SWITCHED Y LEAD (RS485 & RS422)

10 Way Male Subconn	3m Blue Polyurethane Cable	SWITCH BOX	1m White Cable	4mm Banana Plugs	1m Grey Cable	15 Way D Type	0.2m Grey Cable	9 Way D Type	Function
1	WHITE		BLUE	BLACK					Power Ground
2	PINK		BROWN	RED					Power +V
3	RED				RED	9			RS422 TxA
4	BLACK				BLACK	10			RS422 TxB
5	ORANGE				VIOLET	11			RS422 RxA
6	BROWN				BROWN	12			RS422 RxB
7	GREY				YELLOW		YELLOW	2	RS232 Tx (To PC)
8	BLUE				BLUE		BLUE	3	RS232 Rx (From PC)
9	GREEN				GREEN	5	GREEN	5 (link to 1,6,8,9)	RS232 Ground
	SCREEN				SCREEN	SHELL	SCREEN	SHELL	
10	YELLOW								Internal Battery Enable

7 CALIBRATION INFORMATION

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8 EQUIPMENT CHECKLIST

Serial No.	Model No. .....
Customer:	Con Number: .....
.....	Customer Ref: .....
.....	Del. Note: .....
.....	Calibration Cert.: .....

ITEM	Quantity	Serial Number	Initials
Hardware			
Model 606+ Multiparameter CTD ( ) dBar	1		
1.5V alkaline cells (fitted)	8		
Conductivity Test Loop	1		
Stainless steel deployment frame	1		
Suspension Strop	1		
3m Y Lead	1		
Switching Plug	1		
Titanium Grease and Syringe	1		
Tools and Accessories Kit	1		
System Transit Case	1		
Subsea Cable on Reel ( ) metres	1		
Turbidity Option			
Turbidity Sensor			
Calibration Pot			
Dissolved Oxygen Option			
Dissolved Oxygen Sensor			
Electrolyte (250ml)			
Membrane Kit			
Wet & Dry Sandpaper			
Toolkit			
PAR Option			
PAR Sensor			
1m Interface Cable to CTD			
Mounting Bracket			

pH Option			
pH Sensor			
Calibration Pot			
pH4 Buffer Capsule, 10 Pack			
pH7 Buffer Capsule, 10 Pack			
pH10 Buffer Capsule, 10 Pack			
10ml Syringe			
0.5MKCl/AgCl Reference Fluid			
White Nozzle for Bottle			
Green Syringe Needle			
Polypropylene Spatula			
Toolbox			
REDOX Option			
REDOX Sensor			
Calibration Pot			
Standard Solution			
10ml Syringe			
0.5MKCl/AgCl Reference Fluid			
White Nozzle for Bottle			
Green Syringe Needle			
Plastic Bottle			
Toolbox			
Software			
DataLog 400 CDROM	1		
Documentation			
Operating Manual	1		
Calibration Certificate Enclosed	1		

SIGNED …… DATE ……

9 GUARANTEE CERTIFICATE

The following guarantee periods shall apply:

Pressure Transducers and semiconductors	*12 months from date of despatch*
All other system components	*36 months from date of despatch*

During the above periods, Valeport Limited warrants that (at their option), they will replace or repair any faulty items caused by bad workmanship or materials.

Any such claims must be submitted in writing during the above warranty periods.

Valeport Limited shall be under no liability for:

1) Any consequential loss or damage of any kind whatsoever.

2) For any defect or deficiency judged by Valeport Limited to be caused by wear and tear or of improper or unskilled handling of the goods or by any repair or attempted repair or dismantling by any one other than Valeport Limited or persons authorised to do so by Valeport Limited.

3) Batteries and other consumables supplied with the equipment, which are not covered by this guarantee.

Due to the specialised nature of the instrument it should, if possible, be returned to the factory for repair or servicing. The type and serial numbers of the instrument should always be quoted, together with full details of any fault or the service required.

Equipment returned to Valeport Limited for servicing must be adequately packed, preferably in the special box supplied and shipped with transportation charges prepaid. Return transport charges are also to the account of the customer.

Note: Any items supplied as part of a system which are not manufactured by Valeport Limited are covered by the individual manufacturer's guarantee of the equipment supplied.

MODEL NUMBER ..... SERIAL NUMBER .....

DATE OF DESPATCH ..... SIGNATURE.....