

INSTRUCTION MANUAL

TurbiTechw² LR Sensors



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1 Foreword

The TurbiTechw² family of sensors are the latest version of the TurbiTech range. The 'w²' in the product title denotes compatibility with the Waterwatch² range. The sensors are designed for use with the 7300w² Monitor. The term TurbiTech is used for any Partech self-cleaning, Suspended Solids or Turbidity Sensor.

The TurbiTechw² LR Sensor has been specifically designed to monitor final treated, potable and filter water. The sensor is extremely sensitive and is capable of discriminating changes in Turbidity of less than 0.1 NTU. The 90° light scatter monitoring technique makes the sensor sensitive to a wide range of particle sizes, from colloidal material through to larger particles and raw waters and the large mineral particles sometimes found in distribution samples.

The sensor requires very little maintenance, with no special tools or training required. Calibration can be carried out against either a wet Turbidity standard or using the dry calibration reference cell that is supplied with every sensor. The reference cell provides an extremely easy, repeatable method of checking the performance of the sensor without the cost and inherent errors associated with chemical standards.

The TurbiTechw² LR Sensor complies with the internationally recognised ISO7027 standard for Turbidity measurement. The unique sensor design captures stray light which ensures an ultra stable zero point, this is combined with an automatic self-cleaning mechanism that prevent the build up of fouling within the sample chamber.



TurbiTechw² LR Sensor

2 Introduction

2.1 Manual Conventions

All dimensions stated in this manual are in millimetres unless otherwise stated.

The manual has been written assuming the user has a knowledge of instrumentation and an understanding of the type of measurement being made. Training in the use of the 7300w² Monitor and sensors can be provided, please contact Partech for further information.

Icons have been used throughout this manual to draw your attention to precautions and useful notes.

They are categorised in the following way-



GENERAL NOTES – Specifications and general notes of interest to the user.



GENERAL CAUTION – Used where caution is required to prevent injury, damage, corruption of data, loss of calibration or invalidation of warranty etc.



INSTALLATION NOTES – General installation notes of interest to the installer.



ELECTRICAL CAUTION – Used where there is a danger of electric shock to the installer or end user, or where caution is required to prevent damage to the instrument.



MAINTENANCE NOTES – Used to highlight recommended maintenance procedures and help with fault finding.



ENVIRONMENTAL NOTES – General notes on environmental issues, waste and disposal.

2.2 WaterWatch² Trademark

WaterWatchw² is the family name for the w² range of monitors and sensors. Sensors and instruments designed for specific use with the 7300w² Monitor will be suffixed with the w² trademark.

2.3 Scope of Manual

This manual describes the installation, configuration, testing and operation of the TurbiTechw² Sensor. Please refer to 7300w² Monitor manual for standard functions of the 7300w² Monitor.

2.4 External Sensors

External sensors refers to any sensors, expansion modules or instruments connected externally to the 7300w² Monitor.

3 Safety Precautions



3.1 General

Read the safety precautions carefully.

Check the delivery of your WaterWatch² sensor for damage. Any damage should be reported to your supplier as soon as possible.

Use care when unpacking the sensor. **NEVER** use sharp instruments to open the packaging, as this can cause damage to the sensor or cable.

Only use accessories specifically manufactured by Partech for use with this sensor.

Read the operating instructions carefully before installing and operating this sensor.

Keep the cable connections dry and free from contamination during installation.

Keep the sensor away from high voltage cables.



3.2 Electrical installation



Only suitably qualified personnel or a competent person may install, operate or repair this equipment. The installer must ensure all electrical installations comply with local wiring regulations and standards (refer to BS7671 for UK installations).

Please check the sensor has been wired correctly. Incorrect wiring may cause damage to the sensor or monitor.

The WaterWatch² family of sensors are designed exclusively for use with the 7300w² Monitor. **DO NOT** connect to other monitors.

Sensors may need to be correctly addressed to the monitor before use. Please read the *Sensor Configuration* section of this manual for full details.



3.3 Operating

Because these sensors have a wide range of applications, users must acquire the appropriate knowledge to use these sensors in their specific application.

Partech are always available to provide advice and assistance in your application. Please contact Partech for further information.

These sensors may need to be calibrated before use. Please read the *Calibration* section of this manual for full details of calibration procedures.



3.4 Service and Maintenance

Before maintenance, this equipment must be isolated or disconnected from HAZARDOUS LIVE voltages before access.

Maintenance instructions for the TurbiTechw² sensor should be carried out as specified in this instruction manual. Failure to carry out regular maintenance could invalidate the Warranty.

Services and repairs must be carried out by a Partech engineer. Partech can provide a service contract for your system. Please ask for details.



3.5 End of Life Disposal

Equipment should be recycled according to local regulations.

Any calibration solutions should be disposed of as described in the Manufacture Safety Data Sheet accompanied with the calibration solution.

Partech can provide recycling and disposal of your old Partech equipment, and may also provide the same service for other manufactures equipment when replaced with Partech equipment.

Partech may provide a trade-in for old Partech equipment when upgrading your system. Please contact us for further information.



4 The Sensor and Installation

Whilst every attempt has been made to ensure that these instructions are correct, common sense and good engineering practice should always be used, as every installation can present a new set of challenges and difficulties. If you are in any doubt please contact Partech or your local distributor for further information.

4.1 TurbiTechw² LR Sensor

All the TurbiTechw² Sensors in the family use an LED infra red light source, which offers long-term stability, low maintenance and high reliability. All TurbiTechw² Sensors use either Light Scatter or Light Absorption to perform their measurement.

In simple terms, turbidity means cloudy, hazy or not pure. All drinking water, both raw and treated contains some degree of turbidity due to dispersed suspended particles such as silt, clay, algae, organic/inorganic matter or micro organisms.

Turbidity is a measurement quantifying the degree to which light travelling through the water sample is scattered by the suspended particles. The transmission of light is determined by physical parameters such as particle concentration, size, shape and chemical properties. The scattering of light increases with a greater concentration of suspended load. Turbidity is commonly measured in Nephelometric Turbidity Units (NTU). The nephelometric method compares the light scattered by the sample and the light scattered by a reference solution.

The TurbiTechw² LR Sensor measures the turbidity of the sample water in NTU's in accordance with established measurement techniques. The measurement cell has been designed to reduce unwanted stray light to an absolute minimum resulting in a very accurate zero point. The 7300w² Monitor has the facility for converting the units to mg/l under some circumstances, further details are provided in the 7300w² Monitor user manual.

The beam from the LED light source is passed through the sample of water contained in the measurement cell and the amount of light scattered by particles in the sample is measured at 90 degrees to the light source. The 7300w² Monitor uses an LED light source with an optical feedback loop to maintain constant light levels. The sample flows through the flowcell continuously while the TurbiTechw² LR Sensor is in measurement mode. The large bore flowcell reduces the danger of fouling or clogging in raw water applications.

The TurbiTechw² LR sensor is a dedicated flowcell sensor and uses a wiper type cleaner. In the intended clean water applications this wiper is more than capable of keeping the optical surfaces clean. The wiper should be replaced every two years to ensure the cleaning function remains effective.

The TurbiTechw² LR sensor is available in two ranges; 0 to 30NTU & 0 to 500NTU. The range is dictated by the hardware of the flowcell so cannot be changed by the user. Therefore the range should be specified when the instrument is ordered.

All the example screens in this manual relate to the 0 to 30NTU sensor. All the menu options and functionality are identical between the ranges except for the actual numeric value and number of decimal places of NTUs.

5 Mechanical Installation

5.1 Operation Limits

5.1.1 Temperature

The upper operational temperature limit is restricted to 60°C. At low temperatures the limit of operation is 0°C with the practical limitation being ice formation in the sample. The construction of the sensor is such that condensation should not present a problem.

5.1.2 Pressure

The standard flowcell provided is not intended for high-pressure applications and should not be subjected to internal pressures in excess of 1 Bar.

5.1.3 Maximum Levels

High turbidity levels can cause fouling problems that will require manual intervention. An inherent feature of the principal of operation of the TurbiTechw² Sensor is that at very high turbidity levels the sensor output will be seen to reduce, this can in some circumstances produce false low readings.

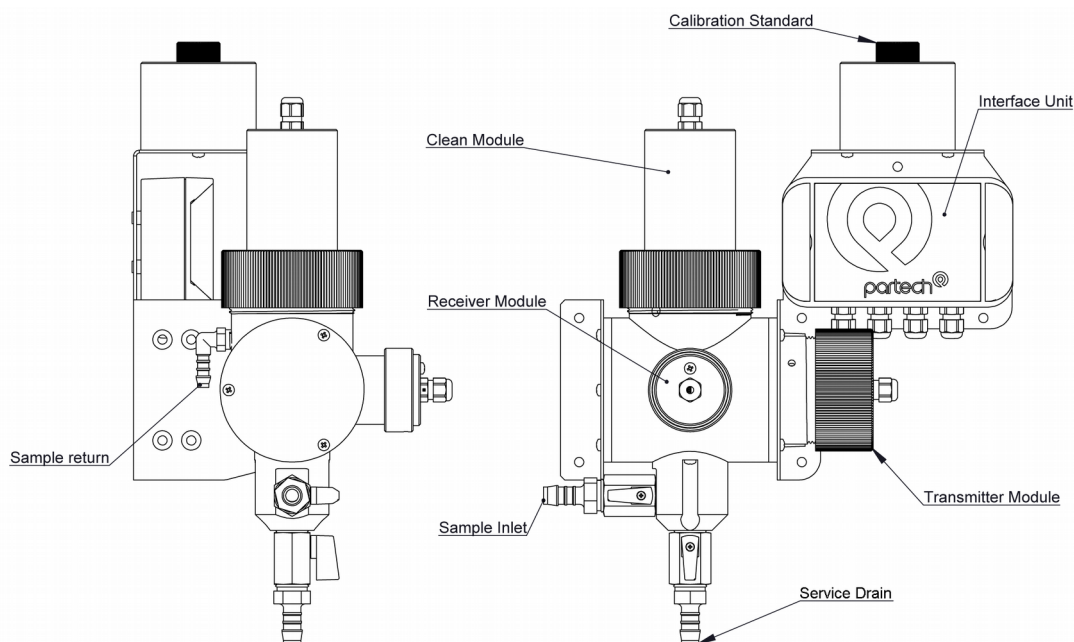
5.1.4 Material Compatibility

Care should also be taken to ensure material compatibility between the media being monitored and the wetted parts of the assembly. The principle wetted parts are black Acetal Co-Polymer, Polypropylene, with Glass Lens. If you are in any doubt about chemical compatibility please contact Partech.

Regulations governing the use of equipment in contact with potable water exist and these need to be understood by the user of this product. It is Partech's belief that the low surface area in contact with the potable water and the normal installation practise of feeding the sample stream to waste mean that this product is suitable for use in potable water treatment processing.

5.2 Sensor Components

The TurbiTechw² Sensor comprises of the transmitting module (light source), receive optics, cleaning mechanism, drain valve, and interface unit.



5.2.1 Transmitter Module

The transmit module, positioned to the right of the flow cell, contains the solid-state emitter and the light intensity control components. The light intensity is controlled automatically preventing signal degradation with time. The light beam passes through the sample water. Light is scattered and focused onto the target area. The transmitter contains precision optical components and must be handled with care.

There is an O-ring seal on the face of the transmitter module. The light source module is retained using a screw collar.

5.2.2 Receiver Module

The receive module fitted on the front of the flow cell is sealed and needs no routine service. The module contains a photo-diode that receives the light from the solid-state light source. The output from the receiver module passes to the microprocessor. The received signal is increased proportionally with the turbidity level.

The receiver uses a combination of optical gain and electronic gain to view a very small area of the flow cell. The receiver contains precision optical components and must be handled with care.

The receiver module may be removed from the flow cell by removing the cable from the interface and the rubber grommets on the bracket. The module can then be unscrewed from the housing. There is an O-ring seal on the face of the receiver module.

5.2.3 Cleaning Module

The cleaning module is located in the top of the measuring cell and locates with a screwed collar. Access to the cell for manual cleaning is most readily obtained by removing the cleaning motor assembly. The cleaning arm has a simple wiper blade attached to it. The module is controlled by the 7300w² Monitor. A location peg makes sure the module is correctly aligned during replacement. Remove this cleaning module for access to the flow cell for cleaning and calibration. Ensure the O-ring is still in place at the bottom of the cleaning module when replacing back into the flow cell.

5.3 Mounting & Installation

Whilst the TurbiTechw² Sensor is suitable for outdoor location we recommend that the 7300w² Monitor is installed indoors or within an outer enclosure. Mount in a location free from excessive vibration.

5.3.1 Process Connections

Sample Inlet

½" BSP Female thread fitted with 12mm Hose-tail, material Polyamide. The inlet is fitted with a Nickel plated brass ball valve.

Outlet

¼" BSP Female thread fitted with 8mm Hose-tail, material Polyamide. This should be free flowing to air and not impose any siphoning effect on the system. The smaller outlet will naturally create a small positive pressure within the flow cell and help minimise the effect of micro-bubbles on the reading.

Manual Drain

There is a manually operated drain tap at the bottom of the flow cell. This allows the cell to be emptied prior to cleaning or calibration. Isolate the sample flow before draining the cell.

½" BSP Female with 12mm Hose-tail fitted, material Polyamide. The manual drain is fitted with a Nickel plated brass ball valve.

5.3.2 Sample Flow Rate

The sample flow rate should ideally be in the region of 1 litre/minute. The minimum recommended flow rate is 0.5 l/min, a lower flow rate will not cause any damage but will result in a slow system response

time. The maximum flow rate is 5 l/min, flow rates higher than this can cause problems with pressure and turbulence.

5.3.3 Sample Pressure



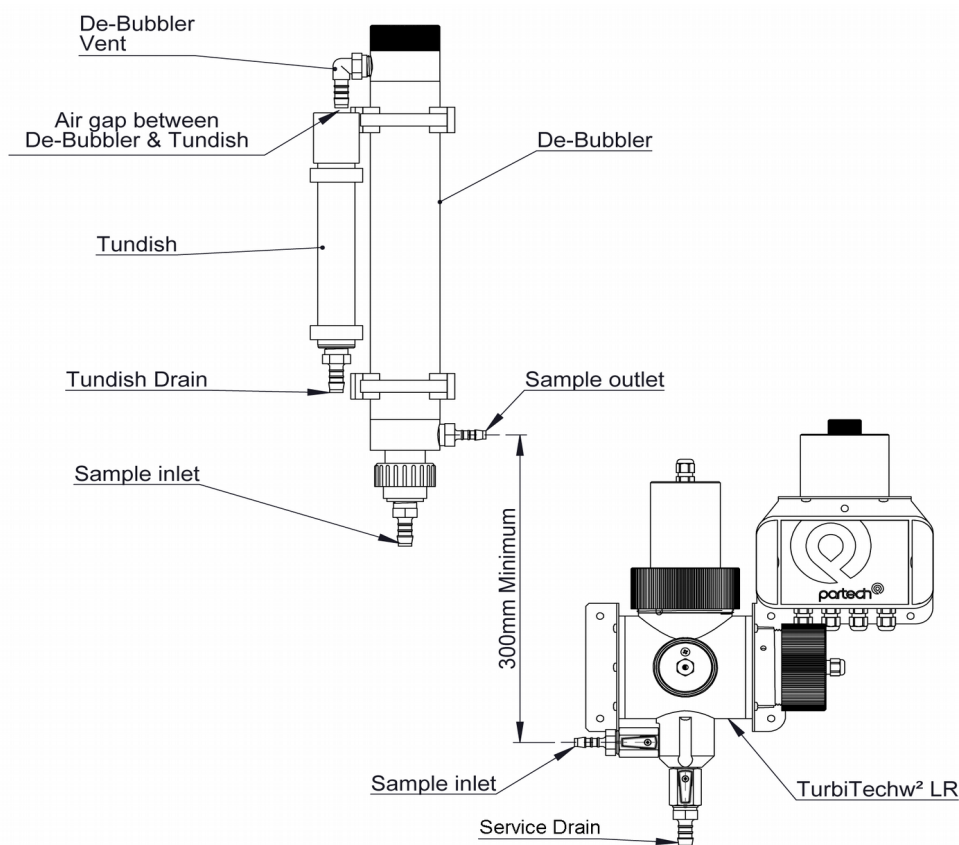
The sensor is not intended as a pressure containing vessel, however a small positive pressure across the cell is desirable for maintaining a smooth flow and to keep gases dissolved in solution. The maximum operating pressure is 1 Bar.

5.4 Optional Accessories

Bubbles in the sample will cause false high and/or unstable readings, micro-bubbles can be generated if the sample pressure is reduced prior to passing through the flowcell. A De-Bubbler is available, but will generally not improve situations where micro-bubbles are problematic. For evening out erratic flow, including occasional air intrusions, the De-Bubbler is an ideal solution. Please talk to Partech about options for mitigating sample conditioning issues.

Note, when fitting the De-Bubbler, please ensure the outlet is positioned minimum 300mm higher than the inlet to the flow cell. This will ensure the flowcell has a minimum of 300mm head of pressure.

Adjust the flow through the De-Bubbler "Sample Inlet" high enough to allow a flow out of the De-Bubbler vent. Once a flow is established, allow to settle for a few minutes, then reduce the flow until the Vent flow just stops (a small dribble from the vent is preferable to allow for small fluctuations in the flow). The De-Bubbler is now correctly set.



5.4.1 Optional Flow Verification Detector

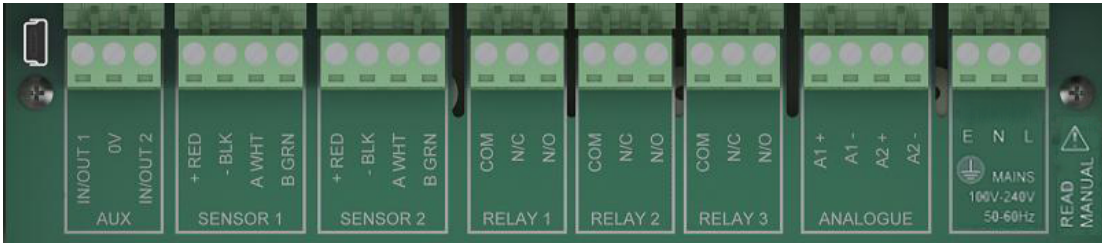
The flow verification detector is an optional extra for the measuring system. The flow verification detector is fitted in-line with the overflow drain outlet. Once connected to the system, the flow verification detector will provide a signal when no flow is detected.

6 Electrical Installation

6.1.1 Electrical Installation



Unscrew the two cover screws on the lower panel of the 7300w² Monitor to reveal the Terminals. Each terminal strip is labelled as illustrated below. (This equipment must be isolated or disconnected from HAZARDOUS LIVE voltages before access). Refer to the 7300w² Monitor user manual for full description of all the terminals within the monitor.



The maximum size wire that can be terminated is 2.5mm² CSA. All the connections are via removable Plug/Socket terminals. To disengage the terminal strip, simply pull down to release.

6.1.2 Sensor Connections

When routing the sensor cables, please ensure the cable is separated from any mains cables. Although the Partech w² sensors have a high resistance to interference, separation of mains and data cables is good practice and should always be followed where practical.

All sensors in the w² range communicate with the monitor using the ModTechw² Protocol. This protocol has been specifically designed to take advantage of the advanced features and diagnostics designed into the w² range of sensors.

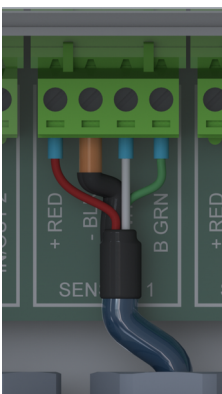
Note- These sensors can **NOT** be used with other monitors that are not included in the w² family.

All sensors within the w² family of instruments are connected to the 7300w² Monitor using the same 4 wire configuration.

- RED and BLACK wires provide the 12VDC supply to the sensor.
- WHITE and GREEN provide data communication.

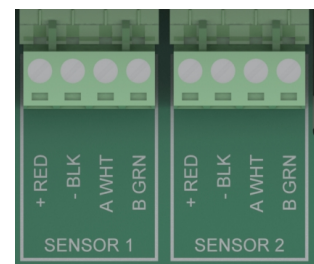
A maximum of two sensors can be directly connected to the standard 7300w² Monitor, additional sensors can be added using the optional expansion boxes available separately.

Remove the 4-way connector from the 7300w² Monitor by pulling downwards to disconnect for easy access to the connections. Connect the sensor cores as follows-



(Terminals from left to right on the 4 way connector)

- Term 1 (Left) - RED (+12V)
- Term 2 - Black (0V)
- Term 3 - White (Data A)
- Term 4 (Right) - Green (Data B)



Always connect the screen drain wire with the Black (Term 2). Illustration Left shows drain wire and Black wire connected together, and covered in Black Heat shrink.

Always use Bootlace ferrules when terminating the sensors to ensure a good connection to the terminals.

6.1.3 Extending Sensor Cables

Sensors are usually supplied with 10M cables (longer cables can be provided if requested). These cables can be extended to a maximum length of 100M. To ensure optimum performance, only use Partech ModTechw² cable for extensions. Partech can supply junction boxes to allow for cable extensions. These should be used on all installations where the cable length from the sensor to the monitor exceeds 20M (Partech Junction boxes include on-board filtering for long cable lengths). Junction boxes are also useful for local connection of sensors close to the sample point. This allows for easy replacement of sensors without the need to pull back cables to the monitor. The junction box has an on-board terminator switch that can be activated to terminate the network if the sensor is to be removed for long periods.

When joining cables, ensure the connection is fully waterproof. Any moisture ingress can effect the communication between the sensor and monitor.

ModTechw² Cable specification-

- 2 Twisted Pair - Red/Black (Power) and Green/White (Data) with Screen and Drain wire
- Cores 24AWG (0,22mm²) 7 x 0,20mm
- Outer Insulation – PUR Polyurethane Blue (RAL5003), Diameter - 5mmØ

7 Sensor Configuration

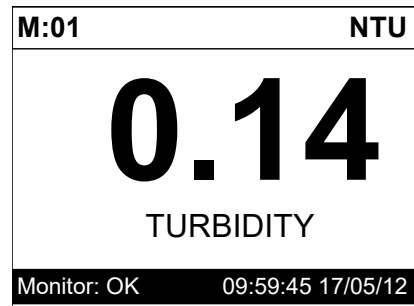
Before attempting to configure the sensor, please read the user manual that came with your monitor. The monitor manual will introduce you to the basic set-up of the monitor, and will familiarise you with the monitor menu structure and buttons.

The monitor leaves the factory with no sensors pre-installed.



Assuming the monitor has been physically connected to a sensor, the next step is to register and configure the sensor before any measurements can be made. A single sensor may provide one or more measurements. We advise only connecting one sensor at a time. Once the first sensor has been registered, connect the second and register again. Repeat for any additional sensors.

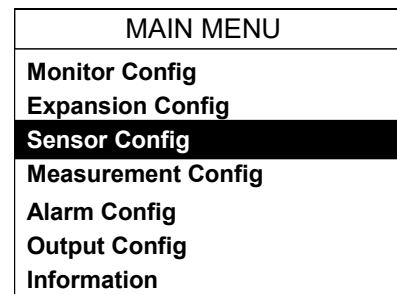
All sensors must be registered to the monitor in this way, even if they are different types.

Please note that live measurements are not available until the Sensor Configuration stage has been completed.



7.1 Sensor Config

From the MAIN MENU screen, select SENSOR CONFIG by pressing , and press  to accept.








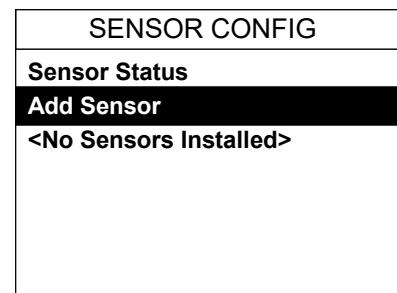
7.2 Sensor Status

This option allows the user to review the current status of the 8 sensor channels, these will all be set to disabled until a sensor is added.




Once a sensor has been installed the display will be updated to indicate the sensor type installed and it's status.

7.3 Add Sensor

- From the MAIN MENU screen, select SENSOR CONFIG by pressing  and press .
- The SENSOR MENU should be displayed. Press  to highlight ADD SENSOR, and press .
- The Monitor will now search all possible addresses (0 to 240) to find any attached sensors. During the search, any sensors found will be displayed momentarily before continuing with the search.
- Once the search is complete, the Monitor will display a list of sensors found. Each sensor will be automatically allocated a new address from S:01 to S:08.
- Repeat the above process to install a second, third or more sensors. A total of 8 sensors are possible (expansion box may be required to add additional sensors).
- Sensor addition is now complete.
- If a single or multiple sensors have been found the  can be pressed to escape from continuing the search.



7.4 S:0x TurbiTechw² LR (0-30)

Once the sensor has been added and registered, the monitor will provide a list of functions specific to the sensor. Press  or  to select the sensor and press . The CONFIG MENU will display a list of sensor functions.

SENSOR CONFIG
Sensor Status
Add Sensor
S:01 TurbiTechw² LR (0-30)

7.4.1 S:0x Manual Clean

This function allows the user to initiate a manual clean cycle. During commissioning it is advisable to perform a manual clean to test the operation of the sensor. This test is also useful for checking the effectiveness of the cleaning action in heavily fouling applications or as part of the sensor servicing routine.

S:01 CONFIG
S:01 Manual Clean
S:01 Info
S:01 Remove
S:01 Modbus Address
S:01 Clean Config


7.4.2 S:0x Info

This function provides a range of diagnostic information that may be requested by Partech for fault finding

7.4.3 S:0x Remove



This allows the sensor to be removed for re-configuration of the monitor or if a sensor has been added on error. If a sensor has been replaced with a new sensors, the old sensor must be removed, and the new sensor installed.

You will be prompted with 'Are you sure?' before the sensor is removed. Press  to accept and remove.

7.4.4 S:0x Modbus Address

This option allows manual adjustment of the ModTechw² address for the sensor, under normal circumstances this should not be changed

7.4.5 S:0x Clean Config

This gives access to a new sub-menu to configure the cleaning regime.

S:0x Clean Interval

This allows this user to set the time between automatic cleans, the time is set in minutes. The factory setting is 360 minutes (6 hours), the frequency can be adjusted between 2 and 1440 minutes (24 hours). Under normal circumstances cleaning should be no more frequent that every 60 minutes. Please remember the more frequently the sensor cleans the quicker the blade will wear out.

S:0x Clean Mode

The sensor 'clean mode' can be set to On/Off.

S:0x Service Life

The factory setting for the sensors is 3500 cleans between services, this equates to around 2 years of normal operation. This service life will need to be adjusted in some applications due to the variable nature of the solids being monitored. Abrasive solids such as sand will cause the seal to wear out more quickly.

S:01 CONFIG
S:01 Manual Clean
S:01 Info
S:01 Remove
S:01 Modbus Address
S:01 Clean Config

S:01 CLEAN CONFIG
S:01 Clean Interval
S:01 Clean Mode
S:01 Service Life
S:01 Clean Service
S:01 Clean Info

S:0x Clean Service

This allows the user to reset the clean counter when a service is carried out.

S:0x Clean Info



This option reports the number of cleans carried out by the sensor since the last reset, the time of the next clean and estimated service life

8 Measurement Configuration

The monitor leaves the factory without any measurements configured. Measurements can only be added after installing the relevant sensor(s).

Once the sensor(s) have been registered with the monitor and installed, the measurements will now be available.

8.1 Measurement Config

From the MAIN MENU screen, select MEASUREMENT CONFIG by pressing , press . The screen shot to the left shows the default configuration after the installation of the TurbiTechw² sensor on a single sensor configuration:

MEASUREMENT CONFIG
Measurement Status
Add Measurement
M:01 Turbidity (S:01)

M:01 = Turbidity (NTU)

8.1.1 Measurement Status








This option allows the user to review the current status of the 16 measurement channels, these will all be set to disabled until a sensor is added. In the example above the first channel will be occupied.

Once a measurement has been configured the display will be updated to indicate the measurement and it's status.

8.1.2 Add Measurement

Unless a measurement has been removed there would be no condition where the 'Add Measurement' option is required as the only measurement type is Turbidity (NTU) which is selected by default when a sensor is installed. The following description is included for the purposes of completeness. **Note the screenshot on the left shows 'Measurement Config' with the Turbidity sensor removed.**

MEASUREMENT CONFIG
Measurement Status
Add Measurement

1. The MEASUREMENT MENU should be displayed. Press  to highlight ADD MEASUREMENT, and press .
2. All available measurements will be displayed in a list. Press  or  to select the first measurement. Note Colour (HU) is the only option.
3. Press  to select the measurement. Repeat the process if more measurements are required.
4. Each measurement will be allocated a measurement number from M:01 – M:16. A total of 16 measurements may be displayed.
5. Press  to return back to the display screen. Your first measurement configured should now be displayed. If two measurements were configured, press  to cycle through the display screens to show 2 measurements, 4 measurements etc.

MEASUREMENT CONFIG
Measurement Status
Add Measurement
M:01 Turbidity (S:01)

The Measurement Menu will list all configured measurements in order M:01 to M:16 the list will also indicate the sensor number that is delivering the signal for the measurement.

8.2 M:0x – Measurement Channel

Selecting a measurement channel will reveal a new sub-menu associated with that measurement. In **MEASUREMENT CONFIG** press to highlight the required measurement and press .

The sub-menu is as follows:

MEASUREMENT CONFIG
Measurement Status
Add Measurement
M:01 Turbidity (S:01)

8.2.1 M:0x Info

This option provides additional information on the measurement, this information will only be required if a problem exists with the instrument performance.

M:01 CONFIG
M:01 Info
M:01 Title
M:01 Units
M:01 Set Zero
M:01 Set Cal
M:01 Averaging
M:01 Remove

8.2.2 M:0x Title

This allows the title of the measurement to be changed from it's default, the measurement title is used in measurement mode to identify the measured value. A selection of standard terms are available along with a 'User Defined' option that can be adjusted to suit your requirements. For example this could be changed to 'Turbidity Line 1'. The maximum number of characters is 20.

8.2.3 M:0x Units

This allows the units of the measurement to be changed from it's default, the measurement units are used in measurement mode. A selection of standard terms are available along with a 'User Defined' option that can be adjusted to suit your requirements. The maximum number of characters is 4.

8.2.4 M:0x Set Zero

The term relate to the calibration of the system and is covered in the section below.

8.2.5 M:0x Set Cal

The term relate to the calibration of the system and is covered in the section below.

8.2.6 M:0x Averaging

This allows the user to impose averaging on the measured value, this is used to reduce the speed of reaction to the process changes. The value can be adjusted between 0 and 6000, the higher the value the slower the reaction time.

8.2.7 M:0x Remove

This allows the user to remove a measurement that has been selected in error or to allow re-configuration of the system. Please use this option with care, all user settings will be lost if the measurement is removed in error.

M:01 CONFIG
M:01 Info
M:01 Title
M:01 Units
M:01 Set Zero
M:01 Set Cal
M:01 Averaging
M:01 Remove

8.2.8 M:0x Display Position

This option allows the position of the measurement to be moved. For example the Colour measurement can be changed from M:01 to M:02 so it will appear second on the list in MEASUREMENT CONFIG menu.

9 Calibration

When a new system is installed, a period of 1/2 hour should be allowed for the TurbiTechw² Sensor to stabilise before calibration commences. This is to enable the system to adjust to the “new” ambient conditions. This should not be considered as system warm up time from power up, but to acclimatise to the environment if the sensor has come from a warm store to a cold sample point.

The standard calibration procedure involves a two point calibration – zero and span, the process for calibration is described below. The sensors have linear responses to most the solids found in most applications, if a particular application has a non-linear response it is possible to adapt the response of the sensor to improve accuracy, this must be carried out in consultation with Partech.

Any containers used to store calibration samples should be cleaned prior to use. This is particularly important when performing the zero point calibration.

The most accurate method of calibration is using a primary standard, i.e. formazine solution. This procedure has associated health risks, therefore Partech supply a dry secondary standard with each flowcell. These standards have been given a calibrated value that is equivalent to formazine in NTU. Under normal circumstances and the correct storage these standards will last the life time of the instrument. It is important they are kept dry and free from scratches on the optical surfaces. The choice of method will depend on the requirements of the application and will be guided by regulatory requirements. Most regulators will require the use of formazine as the primary calibration tool, with the dry calibration reference being used as a performance check.

Note: The secondary dry standard is ALWAYS used to calibrate zero.

If further guidance is required please contact our Technical Support Engineers to discuss your requirements.



9.1 Calibration Frequency

There is no absolute guide to the frequency of calibration. The user must make a judgement based on how critical the measurement is to the process, variability in the sample and standard practice within their organisation.

We recommend that calibration is carried out at commissioning stage and is then repeated within 4 weeks to ensure the instrument and process conditions are stable. After this a default calibration frequency is every 3 to 6 months.

9.2 Equipment required for Formazine Calibrations

This section describes the materials and equipment you will need, and the basic steps required to ensure a successful calibration of the TurbiTechw² Sensor. Regardless of the calibration method, the secondary dry standard is always used to calibrate zero.

The following is required:

- 1 Litres standard (Formazine)
- Dry secondary standard

- Protective gloves.
- Cleaning Materials

Prior to taking any measurements, thoroughly wash any containers used.

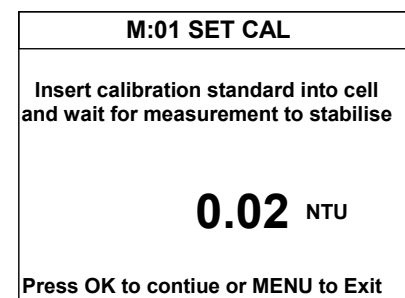
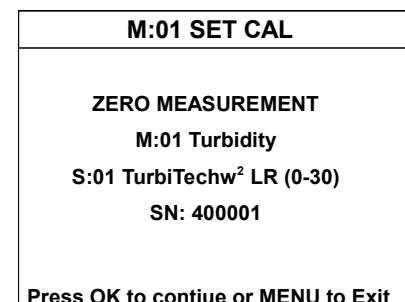
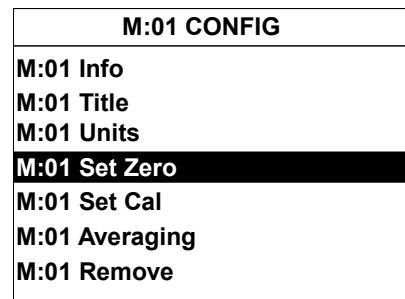
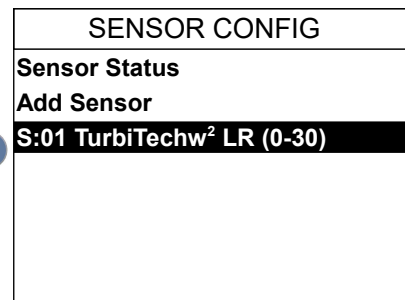
9.3 Calibration Zero

To calibrate the sensor, switch off the inlet hose and remove the cleaning module. The cleaning module is located in the top of the measuring cell and locates with a screwed collar. A location peg makes sure the module is correctly aligned during replacement. When replacing the module ensure the O-ring remains correctly situated.

A dry clean cloth is required to carefully wipe around the inside of the chamber to remove any moisture and fouling. The importance of this stage cannot be over emphasised; even the smallest trace of moisture on the windows will invalidate the solid reference value. It is also important to recognise that placing the solid reference in the cell for prolonged periods will not obtain a stable result. Even within a recently dried cell, moisture absorbed inside the flow cell acetyl will leach out and cause the windows and solid reference to mist up, thus causing the reading to increase. To calibrate zero, place the solid reference inside the flow cell with the blank sides facing forward and to the right (0 NTU mark to the front). Turn the solid reference clockwise as far as possible (looking down on top of the cell) to ensure consistency of positioning.

From the 7300w² Monitor, navigate to the Calibration menu as follows-

- Press to show the "MAIN MENU".
- Select "MEASUREMENT CONFIG" by pressing and press to accept.
- Select "TurbiTechw²" by pressing and press to accept.
- Select "SET ZERO" by pressing and press to accept.
- The SET ZERO screen will be displayed, press to move on.
- The ZERO Calibration screen will be displayed.
- Wait for the value to stabilise, then press to accept.
- Press several times to return back to the DISPLAY screen.
- Zero calibration is now complete.











9.4 Calibration Span








To calibrate the sensor span, switch off the inlet hose and remove the cleaning module. The cleaning module is located in the top of the measuring cell and locates with a screwed collar. A location peg makes sure the module is correctly aligned during replacement. When replacing the module ensure the O-ring remains correctly situated.

A dry clean cloth is required to carefully wipe around the inside of the chamber to remove any moisture and fouling. Fill the chamber with calibration standard (Formazine).





From the 7300w² Monitor, navigate to the Calibration menu as follows-

- Press  to show the "MAIN MENU".
- Select "MEASUREMENT CONFIG" by pressing  and press .
- Select "Colour" by pressing  and press  to accept.
- Select "SET CAL" by pressing  and press  to accept.
- The SET CAL screen will be displayed, press  to move on.

M:01 CONFIG
M:01 Info
M:01 Title
M:01 Units
M:01 Set Zero
M:01 Set Cal
M:01 Averaging
M:01 Remove

- The SET CAL set calibration value screen will be displayed.
- Enter the value for the calibration standard (Default is 10NTU). Press  or  to move the cursor below the digit to be changed. Press  or  to increase or decrease the digit, and press the  to accept the value.
- The SET CAL calibration screen will now be displayed.
- Wait for the value to stabilise, then press  to accept.
- Press  several times to return back to the DISPLAY screen.
- Calibration span is now complete.

M:01 SET CAL
CALIBRATE MEASUREMENT
M:01 Turbidity
S:01 TurbiTechw ² LR (0-30)
SN: 400001
Press OK to contiue or MENU to Exit

M:01 SET CAL
10.00 NTU
Use     to set value
Press OK to accept
Press MENU to cancel

M:01 SET CAL
Insert calibration standard into cell and wait for measurement to stabilise
10.02 NTU
Press OK to contiue or MENU to Exit

9.5 Span Calibration using the Take Sample Routine

The Take Sample and Sample Result menus are provided to allow calibration to be carried out retrospectively based upon stored information. An example of this is where the value of the calibration solution is not known at the time of calibration and an estimated value was used to set the instrument span. The take sample menu is used to store the sensor signal of the calibration solution for later use.

The Set Zero process described above should be carried out before using the Take Sample routine.

9.5.1 Take Sample

The TurbiTechw² sensor should be filled with an instance of the desired sample representative of the normal operating conditions expected from the sample point. The cleaning motor must be present to exclude light. Allow the reading to stabilise before entering the 'Take Sample' routine. Care is needed to ensure that air bubbles are not causing a calibration error.

From the 7300w² Monitor, navigate to the TAKE SAMPLE menu as follows:

Press the to show the "MAIN MENU".

Select "MEASUREMENT CONFIG" using to highlight and press .

Select measurement to be calibrated using to highlight and press .

Select "TAKE SAMPLE" using to highlight and press .

Sensor details screen will be displayed, press to accept.

The last TAKE SAMPLE screen will be displayed, including date, press to accept.

Reading will be displayed. Wait for the value to stabilise, then press to accept the current reading.

The sample value will now be stored in the sensor. "Take Sample Successful" will be displayed.

Press several times to return back to the DISPLAY screen.

'Take Sample' is now complete. The sensor will continue to measure using the original calibration values, however the sample value, time and date will be stored until required.


The sample must now be analysed by a laboratory to establish the Turbidity or Suspended solids present.

Once this information is attained, the value of the sample can be entered into the sensor using the SAMPLE RESULT menu.

MEASUREMENT CONFIG	
Measurement Status	
Add Measurement	
M:01 Turbidity (S:01)	
M:01 CONFIG	M:01 SET CAL
M:01 Info	Take Sample M:01 Turbidity S:01 TurbiTechw ² LR (0-30) SN: 400001 Press OK to continue or MENU to Exit
M:01 Set Zero	
M:01 Set Cal	
M:01 Take Sample	
M:01 Sample Result	
M:01 Averaging	
M:01 Remove	
M:01 TAKE SAMPLE	M:01 TAKE SAMPLE
Last Take Sample Details Sample Date 25/03/2019 14:56:00 Sample User: System Press OK to continue or MENU to Exit	Insert sensor into calibration sample and wait for measurement to stabilise <h1 style="margin: 0;">3.23</h1> NTU Press OK to store sample
M:01 TAKE SAMPLE	M:01 TAKE SAMPLE
Storing Sample Please Wait <div style="background-color: black; width: 100px; height: 10px; margin: 5px auto;"></div>	Take Sample Successful 25/03/2019 15:00:08 Press OK or MENU to Exit

9.5.2 Sample Result

Once the sample result has been established via the 'Take Sample' routine above, the result can be entered into the sensor in the following way:



Press  to show the "MAIN MENU".


Select "MEASUREMENT CONFIG" using  to highlight and press

.

Select measurement to be calibrated using  to highlight and press


.





Select "SAMPLE RESULT" using  to highlight and press .





Sensor details screen will be displayed, press  to accept.


MEASUREMENT CONFIG
Measurement Status
Add Measurement
M:01 Turbidity (S:01)

M:01 CONFIG	M:01 SAMPLE RESULT
M:01 Info	<p>M:01 Turbidity</p> <p>S:01 TurbiTechw² LR (0-30)</p> <p>SN: 400001</p> <p>Press OK to continue or MENU to Exit</p>
M:01 Set Zero	
M:01 Set Cal	
M:01 Take Sample	
M:01 Sample Result	
M:01 Averaging	
M:01 Remove	


The time and date of the last Take Sample will be displayed for the users reference. Press  to accept.


The SAMPLE RESULT screen will be displayed. This provides an opportunity to enter the laboratory results from previous take sample. Press  or  to move the cursor below the digit to be changed. Press  or  to increase or decrease the digit. Enter the known value of the sample.

M:01 SAMPLE RESULT	M:01 SAMPLE RESULT
<p>Last Take Sample Details</p> <p>Sample Date 25/03/2019 14:56:00</p> <p>Sample User: System</p> <p>Press OK to continue or MENU to Exit</p>	<p>3.40 NTU</p> <p>Use     to set value</p> <p>Press OK to accept</p> <p>Press MENU to cancel</p>

Press  to accept the new calibration value.

"Sample Result Successful" will now be displayed: The sensor is now calibrated.

M:01 SAMPLE RESULT	M:01 SAMPLE RESULT
<p>Applying Sample Result...</p> <p>Please Wait</p> <p></p>	<p>Sample Result Successful</p> <p>25/03/2019 15:00:08</p> <p>3.40 NTU</p> <p>Press OK or MENU to Exit</p>

Press  several times to return back to the DISPLAY screen.



10 Maintenance

10.1 General cleaning

Automatic cleaning is controlled by the 7300w² Monitor. A mechanical wiper operates at a pre-set time interval, user configurable by the 7300w² Monitor. This wiper can be set to operate every few hours if conditions demand but is usually set to 6 hourly.

Monthly, or as required, check the measurement cell for fouling. The sensor chamber is easily accessed, by removing the cleaning motor assembly. The two optical windows are then visible, as is the cleaning wiper mechanism. Use a soft lint free cloth to wipe the windows. The windows should have been kept clean by the automatic cleaning cycle. Check the body of the cell for debris or biological fouling and clean as required.

10.2 Inspection

The flow cell will need periodic cleaning, depending on the characteristics of the media being monitored. This would normally be carried out at the same time as calibration.

The sample flowing into the instrument should be representative of the flow to be measured. The flow should be between 0.5 and 5 litres per minute.

Make a routine check of any cable connections or terminations.

From time to time the cleaning blade will need replacement; this would typically be once every 2 years. This operation requires no special tools or training and can be carried out in a few minutes. Wiper blades slide into the stainless steel wiper arms and can be replaced when worn. The ends of the wiper arm should be pressed together gently to grip the blades after fitting.

10.3 Dismantling the Sensor

10.3.1 Removing the Modules

It should not be necessary under normal operating conditions to remove the transmitter & receive modules as this will invalidate any stored calibration values.

In certain circumstances it may be required to replace both modules as a transmit/receive pair as supplied by Partech. However a preferable route would be to return the complete flow cell to Partech for servicing.

The cleaning module is located at the top of the flow cell. To remove, unscrew relevant wires from the terminal block within the interface enclosure and pull cable back through the enclosure cable gland and rubber grommet mounted on the chassis. Unscrew the knurled collar to withdraw the module.

11 Spares

11.1.1 Service Parts

201010.....WaterWatch2310/WaterWatch2970/CoITechw² LR/CoITechw² - Replacement
Cleaner Arms/Wiper Blades (pack of 3)

When ordering seal packs, always provide the model number and serial number of the sensor to ensure the correct seal pack is supplied.



12 Sensor Faults

12.1 Unstable reading on controller

The following can cause an unstable display value:

- Material (rag, weed, etc.) caught inside the flowcell (LR) and affecting the measuring system - remove sensor, manually clean and re-install.
- Turbulence (caused by high flow, aeration etc.) in the solution being measured - increase the level of damping on the 7300w² Monitor.
- Bad connection in the sensor cable - check all connections are secured.

12.2 Error Codes from 7300w² Monitor

The 7300w² Monitor will provide a number of error codes, the majority are generated by and stored in the sensor. Some messages are warnings, such as Clean In Progress which do not require any action.

12.2.1 Input High Limit/Low Limit

This indicates that the measured value is outside the normal operating limits of the sensor. This could be caused by sensor fouling but can also indicate a genuine failure of the optical components.

The following action is recommended:

1. Clean the optical surface of the sensor by hand
2. Place the sensor in a sample (alternatively place an object in front of the optics).

At each stage observe the behaviour of the displayed value. If the error message clears then it is possible that the problem was caused by fouling or by the presence of an object in the sensors optical path.

If the problem returns when the sensor is returned to it's normal location, it is worth checking the Suspended Solids/Turbidity present in the sample against the specified range of the sensor. It is possible that the nature of the application has changed.

If the problem persists please contact Partech or your local representative for further guidance.

12.2.2 Over range/Under range

This indicates that the sensor is receiving a valid measured value that is outside the limits of the measurement configuration. i.e 1,000 NTU when the display range has been set to 500 NTU.

Firstly check that the plant is working normally and that the sensor has not become damaged or fouled.

If the sensor is working correctly and the site is operating normally then it may be necessary to change the configuration of the measurement. This is explain earlier in this manual.

13 General Application Notes

13.1 Preparation of Formazin Turbidity Standard

Preparation of Formazin Turbidity Standard for Calibration.

13.1.1 Health & Safety Precautions

The chemicals used when following this procedure are harmful, therefore the correct safety precautions must be carried out. During handling, avoid inhalation and contact with the eyes or skin. Wash hands thoroughly after use. Refer to the Manufacture Safety Data Sheets for further details of the chemicals used.

13.1.2 Method of Preparation

The preparation of a Formazin Turbidity Standard should be carried out with great care. Absolute cleanliness should be observed at all times to avoid any contamination of the solution.

All water used should be freshly distilled or de-mineralised. During preparation and use, keep the solution covered to prevent contamination.

- Dissolve the Hydrazinium Sulphate 10g (32112680) into 1 litre of water. Stir the solution thoroughly.
- Dissolve the Hexamine 100g (32112630) into 1 litre of water. Stir the solution thoroughly.
- Pour the above solutions into a 2.5 litre Winchester or similar type amber glass bottle and mix thoroughly. Allow the mixture to stand undisturbed for 24 hours at 25°C. The resultant solution will have a turbidity of 4000 FTU.
- Prior to use the standard should be mixed thoroughly, i.e. before pouring out the standard, shake the bottle well.

13.1.3 Preparation of Dilution's.

The 4000 FTU standard can be used to prepare solutions of lower values by diluting with water. The formula below can be used to calculate the ratio of water to 4000 FTU standard to produce a solution of the required value.

$$W = \frac{4000}{A} - 1$$

W = parts water to 1 part 4000 FTU standard

A = Required FTU value

The Formazin Dilution Chart (table QAP 6.14.4) provides the mixture requirements to make various solutions using the 4000 FTU standard.

13.1.4 Calibration

When Formazin solutions are used for calibration/testing of sensors, sufficient solution is required such that the sensor is completely immersed. When using light scatter sensors it is important that the sensor is positioned away from the sides and bottom of the container to prevent the light being reflected.

13.1.5 Storage Life

The turbidity standard should be stored in a Winchester bottle and kept in a cool dark place. The bottle should be labelled to identify its content and also the date of preparation should be recorded. The 4000 FTU standard has a shelf life of one year after which it should be discarded and a fresh solution should be prepared.

Solutions made by diluting the 4000 FTU standard should also be stored in suitably labelled amber glass bottles and kept in a cool dark place. Solutions above 400 FTU have a shelf life of one month after which they should be discarded. Solutions below 400 FTU should be prepared from the 4000 FTU standard daily.

Solutions can be used outside of the storage life specified, but any results taken must acknowledge this and be accepted as less accurate. When using solutions, watch for flocculation (the particles in the solution will appear to link together), if this occurs discard the solution and prepare a fresh standard.

14 Technical Support

Technical Support is available by phone, fax, or email, the details of which are shown below.

- Phone: +44 (0) 1726 879800
- Fax: +44 (0) 1726 879801
- Email: techsupport@partech.co.uk
- Website: www.partech.co.uk

To enable us to provide quick and accurate technical support please have the following information ready when you contact us:

- Serial Number or original purchase details.
- Sensor Type, and Serial Number.
- Application details.
- Description of fault.
- Digital photos can also be useful to determine correct installation and suitability to the application.

14.1 Returning Equipment for Repair

If equipment needs to be returned to Partech for repair or service the following address should be used:

SERVICE DEPARTMENT
PARTECH INSTRUMENTS
ROCKHILL BUSINESS PARK
HIGHER BUGLE
ST AUSTELL
CORNWALL
PL26 8RA
UNITED KINGDOM

Please include the following information with the returned equipment. Also ensure that sensor is clean and adequately protected for transportation (Advice on packing can be provided by our service department).

- Contact name and phone number of person authorising the repair
- Site details including application sample point
- Return address for equipment
- Description of fault or service required
- Any special safety precautions because of nature of application



15 Technical Specification

15.1 Physical

Dimensions.....	440 x 200 x 200mm (HxWxD)
Environmental Class.....	IP68
Enclosure Material.....	Black Acetal Co-Polymer
Weight.....	4.5Kg (inc 10 metres of cable)
Operating Temperature.....	0 to +50° C
Storage Temperature.....	-20 to +60° C
Wetted Parts.....	Black Acetal, 316 Stainless Steel, Glass
Seal Material.....	Nitrile
Mounting Location.....	Indoor/Outdoor
Mounting.....	Wall or Surface
Cable Entries.....	Integral Cable Gland
Cable Type.....	4 core, 2 Twisted Pair, 5mm O/D Polyurethane Coated
Cable Length.....	10 metres Standard, 100 metres Max
Process Connections.....	Inlet and Bypass: ½" BSP with 12mm Hose Tails Outlet: ¼" BSP with 8mm Hose Tail
Pressure Rating (Depth).....	1 Bar
Cleaning.....	Automatic Self Cleaning
Flow Rate.....	0.5 l/min to 5 l/min

15.2 Electrical

Supply.....	12VDC from 7300w ² Monitor
Sensor Communication.....	ModTechw ² Protocol (Specifically developed for WaterWatch ² range)

15.3 Measurement

Low Range.....	0 – 5 to 0 – 530 FTU
High Range.....	0 – 50 to 0 – 500 FTU
	<i>It has been assumed that 1 NTU = 1 FTU for the purpose of this statement, please refer to Partech for further details</i>
Accuracy.....	Better than ±2% FSD on real sample
Resolution.....	±1% FSD or better (0.1 FTU for low range version)
Repeatability.....	Better than ±1% FSD on real sample
Response Time.....	90% of step change in 2 minutes at 1 l/min
Measurement Principle.....	90° Light Scatter, ISO 7027 compliant

