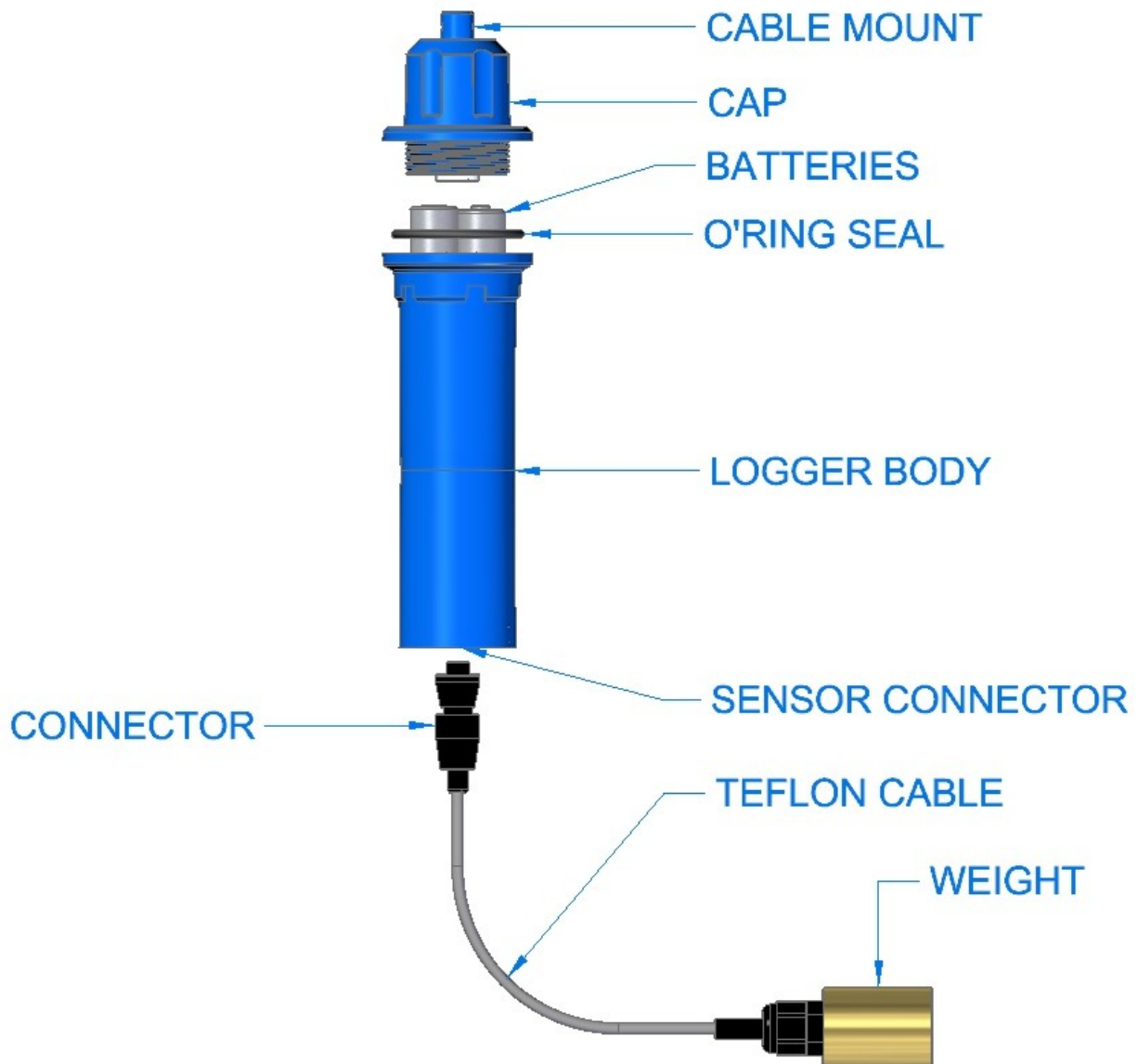




**ODYSSEY  
XTREAM**

# **Odyssey® Xtream Capacitance Water Level Logger User Manual**

## **Xtream Water Level Logger User Diagram**

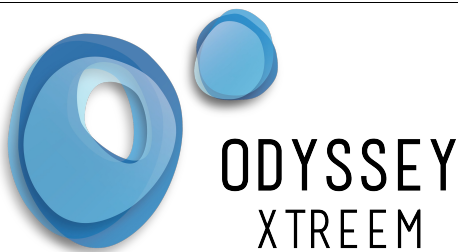




# Odyssey® Xtream Capacitance Water Level Logger User Manual

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# Odyssey® Xtream Capacitance Water Level Logger User Manual

## Principal of Operation

A capacitor consists of two conducting plates or cylinders separated by a non-conducting insulating material. This insulator is called a dielectric. The value of the capacitor (if the distance between the plates is fixed) is directly proportional to the area of the two plates in the capacitor.

The stability of the dielectric material governs the stability or quality of the capacitor. Teflon is used as the dielectric in the Xtream sensor sensors, as it is one of the best dielectric materials available and also has good long-term stability. Teflon has zero moisture absorption; its characteristics are therefore not altered by water immersion.

The Teflon-covered measuring element forms one plate of the capacitor and the Teflon is the insulator or dielectric. The second plate is the water in which the sensor is immersed. As the water level varies, the area of water that is in contact with the Teflon surface also varies. The water is like a cylinder that is moving up and down the cylindrical Teflon-lined element. Hence the variation in capacitance is directly proportional to the height variation of the water in contact with the Teflon. The brass counterweight at the base of the sensor element is also used to make electrical contact with the water.

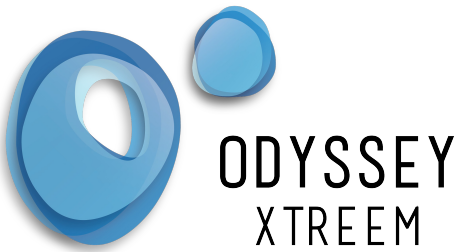
The capacitance value is measured by the electronic module that is mounted at the top of the sensor and recorded by the Odyssey® Xtream logger that is also included in the electronic module. This module converts the value of the capacitance into a digital signal so that the Odyssey® Xtream logger can measure the signal.

## Installation Methods

The Xtream water level sensor does not have a shroud on the sensor element. For open water applications the sensor should be mounted inside a stilling well, this is best made with a PVC pipe. Choose a location as far away from electrical noise sources as possible. If accurate ambient temperature readings are required then the logger must be screened from direct sunlight. Attach a sensor to the logger. The connector is keyed so once this is lined up push the connector in as far as goes and then rotate the top of the connector until it locks into place. The sensor should not come out when light downward pressure is applied to the sensor connector. Do not pull on the sensor cable.

For groundwater measurement in water bores the sensor is simply lowered into the bore. The bore casing or stilling well that the sensor is mounted in should be vertical, otherwise the Teflon element may touch the side of the pipe that it is mounted in and water will be retained between the Teflon element and the pipe. This will result in a measurement error at that point in the measurement range.

When the sensor is installed a manual water height measurement of the water level should be taken so that a true starting point can be verified in the data when it is processed. This correction will take into account any shift in the offset figure obtained when the sensor was calibrated. The manually read water level measurement can be included in the calibration files relative level value. This will enable actual true water levels to be calculated from a known datum point.



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The method of installation will vary with each application; following is a list of suggested methods for some common applications.

- 1) **Above ground small catchment** with V-notch weir and stilling pond. The sensor and Odyssey® Xtream logger can be mounted in a 32mm (inside diameter 37mm) PVC or galvanised pipe, the pipe being attached to a star picket using hose clamps. This pipe will act as a stilling well to limit level variations caused by wind-created ripples on the water surface. The top cap of the Xtream logger has a suspension plug with a hole in it. This is used to tie a stainless steel or nylon suspension line so that the Odyssey® sensor may be suspended from the top of the stilling well. Note that if this line changes in length with temperature it will affect the accuracy of the measurement.
- 2) **Groundwater** Xtream loggers are fitted with a suspension plug on the top cover. This is used to tie a stainless steel or nylon suspension line so that the Xtream sensor may be suspended from the top of the water well down to the water.
- 3) **Stream gauging** A suitable stilling well MUST be used in this application. The stilling well and the anchoring method must also be strong enough to withstand the force of the stream flow. 32mm PVC pressure pipe ( 37mm inside diameter ) is generally adequate.
- 4) **Tide recording** in oceanographic or estuarine applications. Generally a stilling well is required to eliminate wave action and produce a clean recording.

## Teflon Sensor Cleaning

The Teflon sensor element should be carefully cleaned using either water and detergent or methylated spirits. This will remove any deposits that have formed on the element. Care should be taken not to bend the flexible element beyond a 100mm radius as the internal cable may become permanently bent. The Teflon, although reasonably tough, should not be pulled over any sharp surface as this may puncture the element and render the sensor unserviceable.

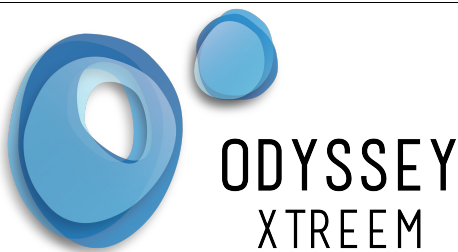
Regular sensor cleaning and calibration checking has been shown to be of vital importance to ensure accurate measurement.

## Installing the Xtract Application

Search Google Play Store or Apple App Store for the Odyssey® Xtract application and install as usual. The application must have access to Bluetooth communications and GPS location services. In the Settings screen enter your username and password provided by Dataflow Systems.

Press the green **SERVER SYNC** button to load the Odyssey® Xtream logger(s) and configuration(s) from the Xpert Web Portal.

The latest Odyssey® Xtract user manual and other user manuals are available on Xpert once you have logged in.



# Odyssey® Xtream Capacitance Water Level Logger User Manual

## **Identifying the Logger**

By default the Odyssey® Xtream logger will arrive with its name being a hexadecimal representation of its serial number. In the Xtract Application press the View button. Once scanned, the Odyssey® Xtream logger located will be shown in the list. The Xtream logger with the highest signal ( also coloured green if it is very close ) is the logger that is closest to the tablet / phone.

## **Setting Up the Logger**

The first time the logger is used, unscrew the top cap and remove the battery insulation disc. All user configuration is carried out in the Xpert Web portal. The tablet / phone running the Xtract application transfers the logged data from the Odyssey® Xtream logger to the Xpert web portal and transfers the configuration into the Odyssey® Xtream logger. Using a web browser ( Firefox is preferred ) navigate to [www.xpert.nz](http://www.xpert.nz), then enter your username and password provided by Dataflow Systems. On the Map page ( default ), select Home from the drop down selection box, then select a logger from the logger selection drop down box. An icon for the selected logger will display on the Map. Click on this icon and an information box above it will pop up. To locate the icon for the first time, it may be necessary to zoom the Map out to find the logger.

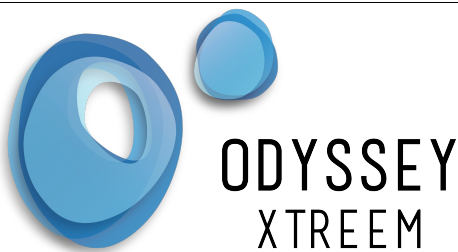
Download the full Odyssey® Xpert user manual from Xpert web portal.

## **Logger Configuration**

1. Select the Logger Config Tab. Enter a Logger Name that will be used to Identify the Logger from now on. The serial number can be used however this is very long and difficult to remember.
2. For most situations use continuous logging which means once the memory is full it will start overwriting the oldest data first. Start and stop time can also be entered.
3. Choose a logging Interval in Hours and Minutes. Suggest using 15 minutes or greater. At an interval of 15 minutes the logger will not overwrite data for 1.5 years.
4. In the Site box, add some brief location information to help locate the logger in the future. In the Notes box add any information that may be of use.
5. Select the Time Zone the Logger is deployed at. This is important as it may be different from the time zone where the data is viewed.
6. Press the Submit button to apply the Logger Configuration.

## **Sensor Configuration**

1. Select the Sensor Config Tab.
2. From the drop down box select the sensor length that has been connected to the logger. Note if the wrong length is selected, the logger may not show any useful data.
3. Press the Submit button to apply the Sensor Configuration.



# Odyssey® Xtream Capacitance Water Level Logger User Manual

## ***Calibration***

Select the Calibration Tab. For the first time use, confirm that there is no data entered into the readings. If there is, tick the Restore Factory Defaults box then press the Submit button to apply this setting.

## ***Transfer Configuration to Logger***

The configuration will be sent to the logger automatically ( typically less than 10 minutes ) through the tablet / phone running the Xtract Application. To apply this immediately, press the '**SERVER SYNC**' button in the Settings screen. Once the button has been pressed the time below the button will display the word 'Never', then once synced, it will change to a valid time.

Select the History screen in the Xtract Application to view the logger name(s) entered for the Odyssey® Xtream logger(s).

The next time the tablet / phone sees the logger, it will connect to it and automatically apply the settings.

## **User Calibration**

Equipment:

- Fine tip waterproof marker pen.
- Tablet / Phone with internet connection.
- Tape measure.

Note: It is best to calibrate on-site using the water and environment that the logger will be used in. As the logger is a very sensitive instrument keep it at least 10m away from any electrical noise source including fluorescent lights.

### ***Bottom Up Calibration***

To provide a calibrated value that is increasing from the bottom of the sensor upward, (as would be required for surface catchments), the bottom of the counter weight is used as the zero reference point (this is the method described in this instruction).

### ***Top Down Calibration***

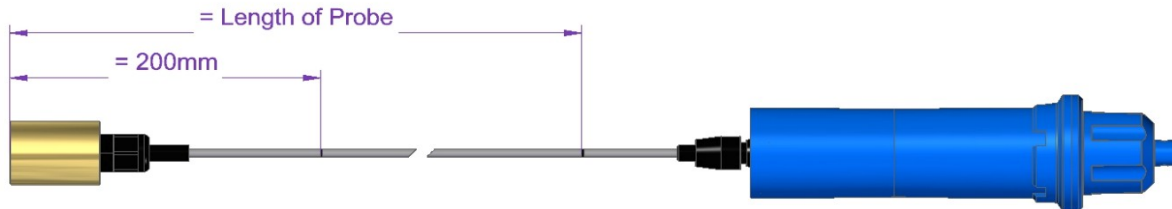
If the sensor is used in a bore and the water levels are required as a measurement from the top of the bore down to the water level, then the sensor should be calibrated from the top down.

Remove the top cap from the logger and use the point where the top cap meets the logger housing as the zero reference point. Follow the instructions described below but use this as the reference point instead of the bottom of the counter weight.

## ***Obtaining User Calibration Values***

1. On the Teflon sensor cable gently mark two points using a fine tip waterproof marker. The first point should be 200mm up from the bottom of the counter weight and second marked at the point that is equal to the specified length of the sensor. For example, if the sensor is 2m then

the second mark should be 2m up from the bottom of the counter weight.



2. Using the tablet / phone running the Xtract Application press the View screen button .
3. Scanning will start. Tap on the line with previously named logger from the list shown. The Xtract application will then connect to the logger ( approx. 20s to connect ) and show its current readings. This will be updated once every 10s.
4. Lower the sensor into the water vessel until the water reaches the first mark at 200mm. Hold the sensor at this point until the raw data reading is steady and write this value down. Note there may be a decimal point.
5. Repeat step 4, but this time lower the sensor until the water reaches the second mark. Write down the raw data value recorded. Note there may be a decimal point.
6. Write down the logger temperature reading also as this is required for loggers with factory temperature compensation.
7. If the number shown are greater than 6553.0, then check the sensor is plugged in correctly. To check the logger / sensor configuration has been applied, select the History screen and tap on the logger name. If the Setting Version or firmware version is in Red then it has not been applied to the logger yet.

## Applying the User Calibration

Using a web browser ( Firefox is preferred ) navigate to [www.xpert.nz](http://www.xpert.nz) then enter your username and password provided by Dataflow Systems. On the Map page ( default ) select Home from the drop down box then select a logger to be configured. An Icon for the selected logger will display on the Map which must be clicked on when located. ( It may be necessary to Zoom the Map out to find the Logger ).

1. Select the Calibration tab from the Menu.
2. Enter the first and second readings as recorded in the above section Obtaining User Calibration Values
3. Enter the Temperature as recorded above.
4. Confirm that the sensor length is correct. If it is not correct, perform the Sensor Configuration step Setting Up the Logger in section Sensor Configuration.
5. Press the Submit button to apply the Sensor Configuration.
6. Transfer the configuration to the logger as previously done in section Transfer Configuration to Logger.



# Odyssey® Xtream Capacitance Water Level Logger User Manual

## Collecting Data

Bring the tablet / phone with the Xtract application running within range of the logger and the application will automatically find, connect and collect the logs from the logger. This can be seen happening on the main screen of the Xtract application. If any configuration changes have been made since the logger was last connected, these will be applied at this time. If there is a firmware update for the logger this will also be sent (this takes several minutes to complete ) to the logger if automatic firmware updates have been enabled ( Contact Dataflow Systems to enable Automatic firmware updates ).

To confirm the date of the last log that has been collected, select the History screen then tap on the logger name.

## Viewing Data

Using a web browser ( Firefox is preferred ) navigate to [www.xpert.nz](http://www.xpert.nz) then enter your username and password provided by Dataflow Systems. On the Map page ( default ) select Home from the drop down box then select a logger to be configured. An Icon for the logger will display on the Map. Click on the icon. ( It may be necessary to Zoom the Map out to find the Logger ).

### ***ICON pop-up***

This pop up shows brief data on the selected logger

### ***Selected Logger Box***

This shows the logger which has been selected on the Map tab.

### ***Latest Information Box***

This shows the latest known information about the logger.

### ***Chart***

Once the logger has been selected choose the chart option from the menu.

To view a graph of the logged data select a date range, then press the Go button. For a quick view press one of the Last Day, Last 7 Days, or Last 30 Days buttons. To export the data right mouse click on the graph then select the export format required. To view other data collected from the logger, in the drop down box showing Primary Data select Diagnostic Data, then select a date range or press one of the quick Day buttons.

## Errors

The Odyssey® water level sensor is a linear measuring system, however errors can still occur.

### ***Reading Higher Than Actual on Falling Water Level***

Sediments or suspended solids are forming a coating on the Teflon sensor. This deposit will hold a film of water and cause a slight elevation of the reading. This type of error will only be a problem when the rate of movement of the water is high. For slow movement in the water level the sediment will dry before it can cause a significant error in the reading.

Frequent sensor cleaning is the best method to reduce this type of error. It will only be a problem in water that is very heavily laden with silt and has a fast rate of decline.

Pressure differentials can be created in a stilling well by incorrect positioning of the stilling well in flowing water. This may cause elevation or depression of the reading depending on the positioning of the water inlet holes in the stilling well. Try to position the water inlet holes so that the stream flow has minimal effect on the water level inside the stilling well. A bottom vented stilling well will generally overcome this problem. A copper water inlet tube will help to lessen the problems of algae deposits in the stilling well (Copper is algacidal).

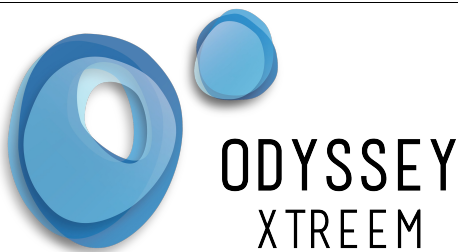
### ***Reading Lower Than Actual on Rising Water Level***

This type of error may be caused by deposits on the Teflon that are non-wetting. The result of this will be an apparent increase in the Teflon wall thickness. The Teflon element should be cleaned to discourage this type of deposit from forming.

A second cause of this error is the release of dissolved gases from the water. This will only be a problem on waters that are highly aerated. This causes the formation of tiny bubbles on the Teflon and will cause an apparent depression of the reading. If this is suspected a sample of water should be taken and left to stand for 24 hours to see if gas bubbles form on the container wall. A double stilling well may reduce the problem by reducing the water exchange rate and thus dissolved gas in the stilling well.

### **PVC SHROUD**





# Odyssey® Xtream Capacitance Water Level Logger User Manual

A 32mm PVC pipe ( 37mm inside diameter) can be used as a stilling well as the logger housing is sized to catch in the top of the pipe. It should have 6mm holes drilled every 20cm over the entire length of the piece of pipe. This allows water to freely enter the well and helps to ensure that the water level measurements are linear over the entire length of the sensor element. A kit can be purchased in 1m lengths from Dataflow Systems at [www.odysseydatarecording.com](http://www.odysseydatarecording.com) and also a PVC logger cover can be purchased to disguise the logger.

## Memory Storage Capacity

The memory is capable of recording at least 60000 records. The number of recording days before the memory is full can be calculated using the following formulae. If continuous logging is enabled the oldest will overwritten first. If continuous logging is disabled no more data will be collected.

$$\text{Recording Days} = \frac{60000}{\text{Records per day}}$$

Examples.

| Interval (mins) | Records per Day | Recording Days |
|-----------------|-----------------|----------------|
| 60              | 24              | 2500           |
| 30              | 48              | 1250           |
| 15              | 96              | 625            |
| 10              | 144             | 416.67         |
| 5               | 288             | 208.33         |

It is recommended to use the longest interval required as this reduces the collection time and speeds up the graphing process.



# Odyssey® Xtream Capacitance Water Level Logger User Manual

## Batteries

### Life

The battery life is dependant on a number of variables, including the sampling interval and operating temperature. The remaining battery life is indicated in the Xpert web portal. In typical conditions ( 25°C ), battery life is expected to be approximately 2 years.

### Replacement

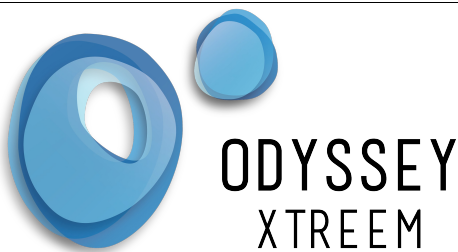
To replace the batteries, unscrew the cap and lift out the 2 batteries. Over time the cap can become very tight, so use the special Odyssey® spanner for opening the cap which is available from [www.OdysseyDataRecoding.com](http://www.OdysseyDataRecoding.com). As the batteries are non-hazardous, disposal is with your normal rubbish. We recommend with temperatures greater than 0°C to use the Energizer Max E91 with PowerSeal Technology batteries as these have been tested in our Xtream products to give the best life and are least likely to leak. At 0°C the battery life is reduced to half of its calculated life and it further reduces to 1/8<sup>th</sup> of its life at -20°C.

For temperatures below 0°C we recommend Energizer Lithium L91 batteries and these will have a life of greater than 2 years even at -20°C. Replace the batteries in the logger in the indicated orientation in the battery holder. ( Note the unit will not be damaged if the batteries are inserted incorrectly ). Before replacing the cap check the O-Ring seal is present, clean and free from dirt. If required apply some silicon grease ( available from [www.OdysseyDataRecoding.com](http://www.OdysseyDataRecoding.com) ). Replace the cap and tighten by hand. Do Not use any tools to tighten the cap.

If the logger is not to be used for more than a year, then remove the batteries to prevent any chance of leaking.

## Specifications

|                       | Description                                                         |
|-----------------------|---------------------------------------------------------------------|
| Radio                 | NRF52832 Bluetooth SOC from Nordic Semiconductor                    |
| Frequencies           | 2402 – 2480MHz                                                      |
| Modulation            | GFSK                                                                |
| Bandwidth             | 1MHz                                                                |
| Output Power          | +4.0dBm max                                                         |
| Antenna               | Ceramic Chip with 0.5dB gain.Return Loss -9.5dB<br>UFL ( external ) |
| Operating Temperature | -20 to 55°C (standard)                                              |
| Relative Hunidity     | 0% to 100%                                                          |
| Water Proof           | IP67, (IP68 Optional)                                               |
| Dimensions            | 46mm Diameter, 160mm Length<br>Sensor Lengths Various               |



# Odyssey® Xtream Capacitance Water Level Logger User Manual

## Intellectual Properties

- Bluetooth® is a registered trademark owned by Bluetooth SIG Inc.
- Odyssey® is a registered trademark of Dataflow System Limited.

## Legal Information

### FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### Radiation Exposure Statement

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.

### Japan (MIC)

The Xtream loggers are approved for use in the Japanese market.  
In Japan, certification is valid for 80 channels between 2402...2481 MHz

### CE Warning

This device has been tested for compliance with the relevant standards for the EU market.  
A copy of the Declaration of Conformity is available upon request to the manufacturer.  
Dataflow Systems, PO Box 13672, Christchurch 8023, New Zealand

### Radiation Exposure Information

This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.

### Industry Canada

This device complies with ISSED's licence-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

### Radiation Exposure Statement

This equipment complies with ISSED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.