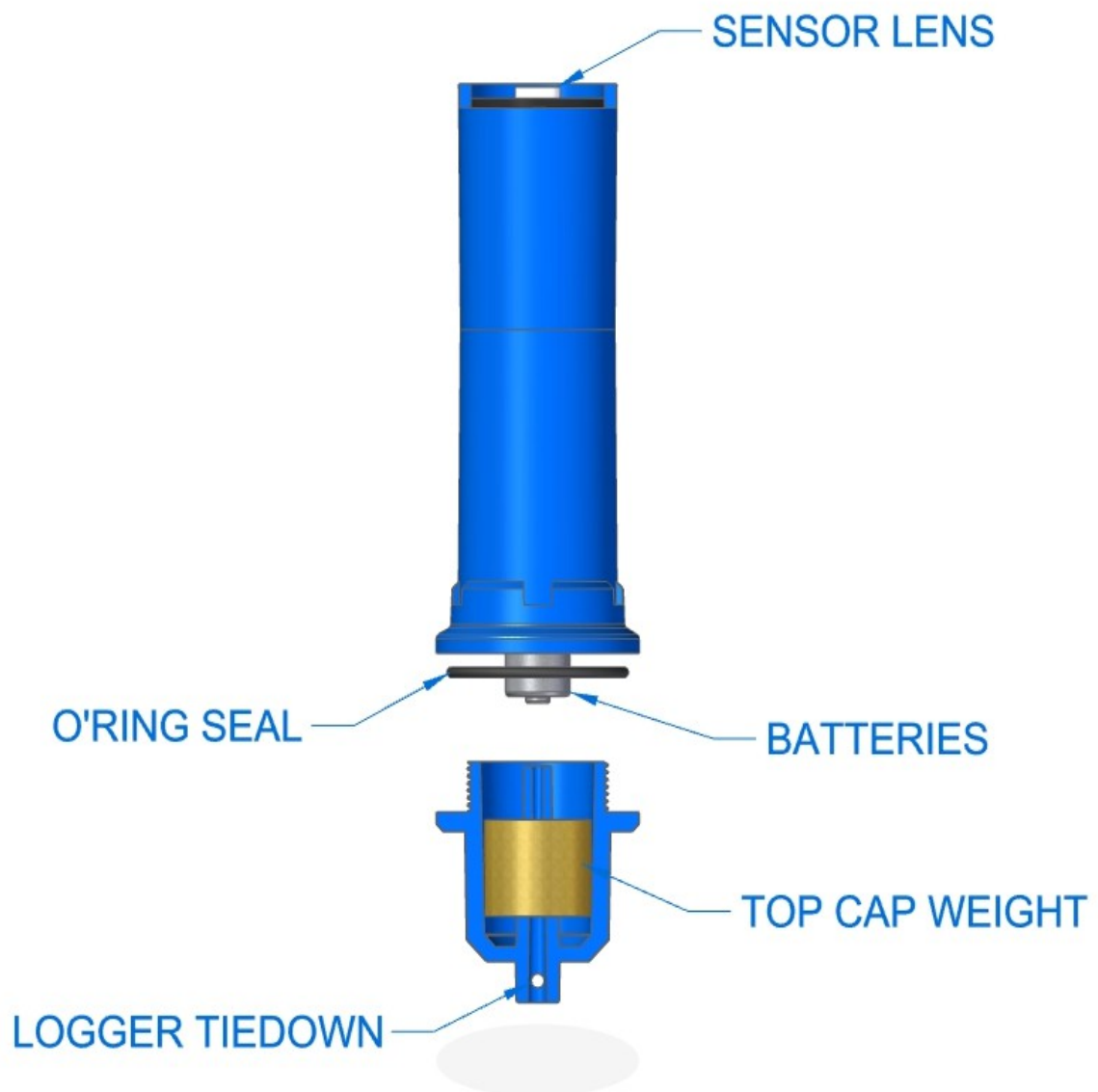




**ODYSSEY
XTREAM**

Odyssey® Xtream PAR Logger User Manual

Xtreem PAR Logger User Diagram

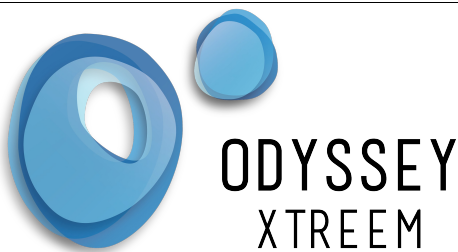




Odyssey® Xtream PAR Logger User Manual

Contents

Xtream PAR Logger User Diagram.....	1
Principle of Operation.....	3
Installation Methods.....	3
Sensor Cleaning.....	3
Installing the Xtract Application.....	3
Identifying the Logger.....	4
Setting Up the Logger.....	4
Logger Configuration.....	4
Logger Calibration.....	5
User Calibration Procedure.....	5
Calculations.....	6
Calibration Test Calculations.....	6
Collecting Data.....	7
Viewing Data.....	7
ICON pop-up.....	7
Selected Logger Box.....	7
Latest Information Box.....	7
Chart.....	7
Memory Storage Capacity.....	9
Batteries.....	10
Life.....	10
Replacement.....	10
Specifications.....	10
Intellectual Properties.....	11
Legal Information.....	11



Odyssey® Xtream PAR Logger User Manual

Principle of Operation

The photosynthetically active radiation (PAR) logger measures light in the spectral range that plants, and other organisms, use in the process of photosynthesis. Photosynthesis is dependent on the total number of photons in a given time period (interval). The sensor and electronic circuit used in the logger converts light to a count value with the maximum value being 65534.

The units of this measurement are normally $\text{mol m}^{-2}\text{s}^{-1}$ and the Xtream PAR logger can easily be calibrated against a reference standard to give results in SI units typically $\mu\text{mol m}^{-2}\text{s}^{-1}$.

The logger also includes an integrated temperature sensor to measure the ambient temperature around the logger. For above ground situations sun loading will prevent this sensor being accurate during daylight hours. For submersible situations this sensor will record the surrounding water temperature.

Installation Methods

The Xtream PAR logger is extremely versatile so can be used outside, in glass houses or in the ocean at depths up to 30m.

The logger should be mounted vertically with the sensor pointing up. In a typical situation the sensor should not be shaded by surrounding objects.

A low cost saddle clamp is available from Odyssey® for mounting the logger to a wooden post or a metal plate.

As an added precaution, use the tie hole in the cap to secure the logger to the clamp.

Sensor Cleaning

The sensor should be kept as clean as possible to get reliable and repeatable results. For above ground installations there is a water drain hole beside the sensor which must be clean. This allows any water to drain away from the sensor.

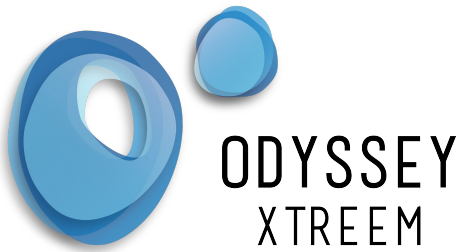
For submersible installations use a mechanical wiper available from Odyssey®.

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



Odyssey® Xtream PAR Logger User Manual

have logged in.

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, 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

- 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.
- For most situations use continuous logging. This means once the memory is full it will start overwriting the oldest data first. Start and stop times can also be entered.
- Choose a logging Interval in Hours, Minutes and Seconds. Intervals selected below 1 minute will force continuous logging to be disabled. At an interval of 10 minutes the logger will not overwrite data for more than a year. Note: Once calibrated, changing the logging interval will change the plotted and exported data values that were collected with a different logging interval.
- 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.
- 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.
- Press the Submit button to apply the Logger Configuration.

Logger Calibration

See the section *User Calibration Procedure* to obtain the calibration values.

- Select the Calibration Tab.
- Enter the **Logger Reading Total**.
- Enter the **Reference Reading Average**.
- Select the **Reference Units** displayed on the reference. This will be used on the chart and reports.
- Enter the **Test Duration** in minutes.
- Press the Submit button to apply the Calibration.
- Press the Reset button to auto fill the vlaues for the calibration test.

User Calibration Procedure

Equipment:

- Tablet / Phone with internet connection.
 - Reference PAR integrating meter.
1. In the calibration tab press the Reset button then the submit button.
 2. Set the reference meter to any known interval. We suggest 5 minutes or more for this interval.
 3. Place the logger and the reference in the same location in sunlight, making sure that they do not shade each other.
 4. Start the Test. Best results are achieved if this test is started before the sun comes up and finishes once the sun goes down however it can be done with a shorter test duration.
 5. AT the end of the test once the tablet has uploaded the readings to the server these will be visible on the chart page.
 6. Export these readings by pressing the 'Send Report button' on the chart page.
 7. Once you have opened the exported file, add all the readings together for the entire test duration. If there are any saturated values (reading = 65535) then the test will need to be repeated with the **Logger Interval** reduced. Note the **Test Duration** value must equal the **Logger Interval** while performing the test.
 8. On the calibration page enter this value into the **Logger Reading Total** box. Enter the entire duration of the test into the **Test Duration** box. The interval is set on the Logger Config page and is automatically entered into **Logger Interval** box.
 9. For the reference logger, average the readings for the duration of the test. Enter this value into the **Reference Reading Average** box. Also enter the **Reference Units** used into the units box. Once all fields have been populated press the submit button.

10. The logger is now ready to use. It is possible to check the result by viewing the graph or export the data for the test duration and then compare this to the reference data collected for the test.

The calibration is applied when the chart is displayed so if the calibration is changed or the logger Interval is changed the results displayed on the chart will change when refreshed.

If the logger interval is changed it is not necessary to perform another calibration however any data collected previously with a different logger interval than that shown on the calibration page will not display correctly on the chart.

Calculations

The Xpert Portal calculates the final calibrated PAR value as follows:

$$\text{Calibrated PAR Value} = \text{Logger Reading} \times \left(\frac{\text{Reference Reading Average} \times \text{Test Duration}}{\text{Logger Reading Total} \times \text{Logger Interval}} \right)$$

From the formula above, it can be seen that the four values entered on the calibration page simply produce a scale factor.

Furthermore, if the Logger interval is doubled the Calibrated PAR Value will halve, however since the actual interval the reading is taken over is twice as long, the reading will be twice as large therefore the calibration interval used by the logger does not affect the final calibration.

Calibration Test Calculations

When the **Reset** button is pressed, Xpert sets both the **Reference Reading Average** and the **Logger Reading Total** to be the same value (1000). It also sets both the **Test Duration** and the **Logger Interval** to be the same value (5 mins).

$$\text{Calibrated PAR Value} = \text{Logger Reading} \times \left(\frac{1000 \times 5}{1000 \times 5} \right)$$

As the scale is 1 the Calibrated PAR Value will be equal to the Logger Reading. i.e. the raw logger value.

It can be seen from this formula that for the calibration test, the **Logger Interval** can be set to any number of minutes as long as the **Test Duration** is also set to the same value.

Note: Only the logging Interval is sent to the logger. All other calculations are carried out on the cloud server and can be changed at any time.

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 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. Alternately, enter a date range then press the Send Report button. A link to download the file will be sent to the registered email address. 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.

In the example chart below, the red trace shows the temperature in C and the orange trace shows the light in $\mu\text{mol s}^{-1} \text{m}^{-2}$.



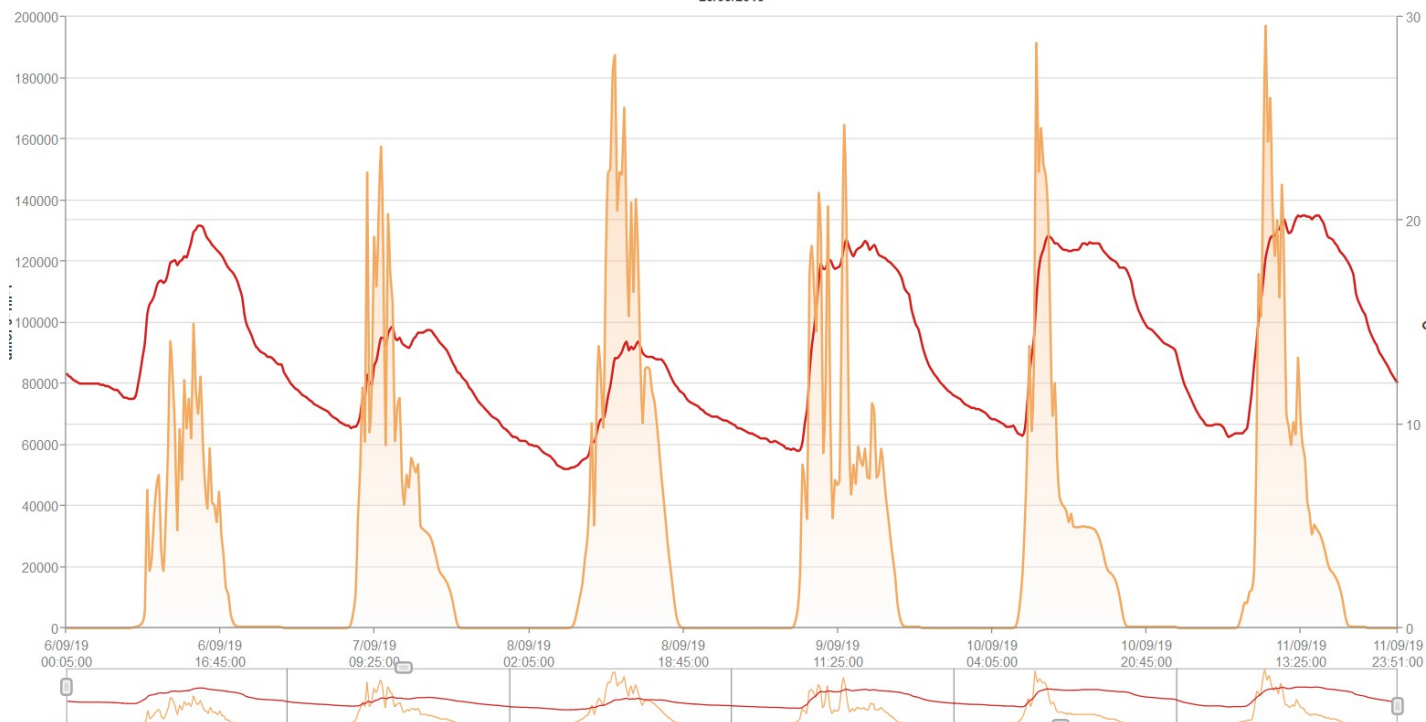
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PAR - F185C734A379 - Data Points = 576

20/09/2019

umol s-1m-1 °C



Example PAR Chart

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 be 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 PAR Logger User Manual

Batteries

Life

The battery life is dependent 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. 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 1/8th 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). 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 UFL (external)
Operating Temperature	-20 to 55°C (standard)
Relative Humidity	0% to 100%
Water Proof	IP68 30m
Dimensions	46mm Diameter, 160mm Length



Odyssey® Xtream PAR 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.