TURNER DESIGNS
Reliable Instruments for an Unreliable World

Ballast-Check™2
Handheld Fluorometer
for Indicative Compliance Monitoring of Ballast Water

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WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE
Turner Designs is in the business of designing and selling products that benefit the well-being of our environment. Accordingly, we are concerned with preserving the surroundings wherever our instruments are used and happy to work with customers by complying with the WEEE Directive to reduce the environmental impact resulting from the use of our products.

WEEE Return Process:
To arrange the return of an end-of-life product, proceed as follows:

If you purchased your instrument through a Turner Designs Distributor please contact your local representative. They will instruct you where to return the end-of-life product.

If you purchased your instrument directly from Turner Designs please contact Turner Designs Customer Service
By Phone: 1-408-212-4041 or Toll Free: (877) 316.8049
By Email: Customer Service at support@turnerdesigns.com
Turner Designs will provide a WEEE RMA Number, a Shipping Account Number, and a Ship to Address. Package and ship the product back to Turner Designs.

The product will be dealt with per Turner Designs' end-of-life recycling program in an environmentally friendly way.

1   Principles of Operation

1.1 General Approach

Ballast-Check 2 quantifies algae of the 10 – 50 micron size class in ballast water samples as an indicator to be used for assessing the performance of Ballast Water Treatment Systems (BWTS) in achieving the IMO/USCG D2 standard.

The instrument is a multiple turnover Pulse Amplitude Modulated (PAM) fluorometer that provides a rapid, indicative analysis of ballast water samples.

This enables ship operators to quickly assess the risk of exceedance of the D2 discharge standard for ballast water. Risk of contamination is determined using measurements of the Abundance and Activity of algae in ballast water.

High Risk:	High Algal Abundance	**AND**	High Algal Activity
Low Risk:	Low Algal Abundance	**OR**	Low Algal Activity

This approach is in line with IMO BWM.2/Circ.42/Rev.1 - 28th May 2015. GUIDANCE ON BALLAST WATER SAMPLING AND ANALYSIS FOR TRIAL USE IN ACCORDANCE WITH THE BWM CONVENTION AND GUIDELINES (G2). Where indicative analysis shows poor or suspect control, users are advised to confirm performance of the BWTS using more detailed analysis methods as in the above document.

1.2 Abundance of Algae

Ballast-Check 2 is configured for detecting chlorophyll fluorescence from live algal cells (i.e. *in vivo* detection of Chlorophyll). Light from the fluorometer is absorbed by algae, which causes the cell to fluoresce. Fluorescence emitted by the cells is detected, quantified, and displayed as a digital number estimating the abundance of algae in the sample. Environmental conditions such as; presence of interfering compounds, cellular physiology, and light history can influence abundance estimates, the procedure used to analyze samples on Ballast-Check 2 accounts for most of the interferences, providing an accurate estimate of algal abundance as cells/ml for 10 – 50 micron sized cells.
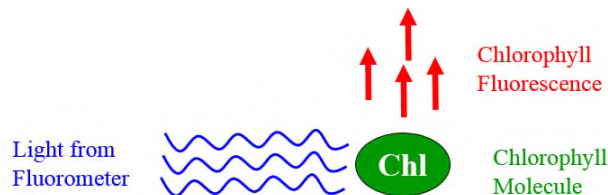
1.3 Activity of Algae (Viability)

Ballast-Check 2 uses two LEDs to estimate photosynthetic efficiency. The first LED (monitoring) is used to excite the sample with very low light intensity so as not to induce a change in chlorophyll reaction centers. While continuously monitoring the sample using the monitoring LED, the second LED (saturating) blasts the sample with a high intensity of light to bring algae to a higher fluorescence state (Fm). The difference between the monitoring LED's measurement of the maximum (Fm) and minimum (Fo) fluorescence states is called variable fluorescence (Fv). The ratio (Fv/Fm) is a good measure of the algal activity, which is measured as a ratio between 0.01 and 0.75.
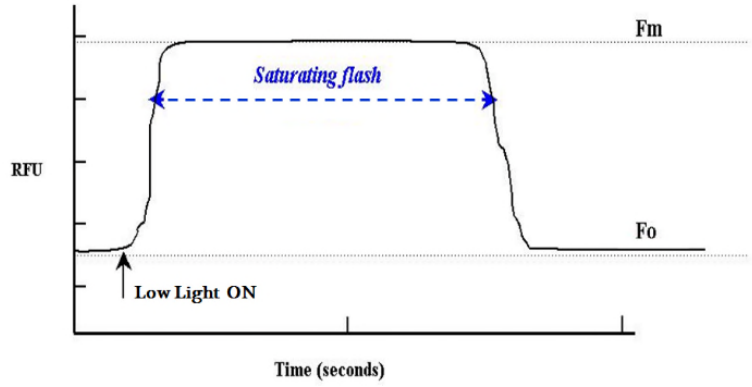
1.4 Quick View Diagrams

Ballast-Check 2 uses four standard or rechargeable AAA user-replaceable batteries.
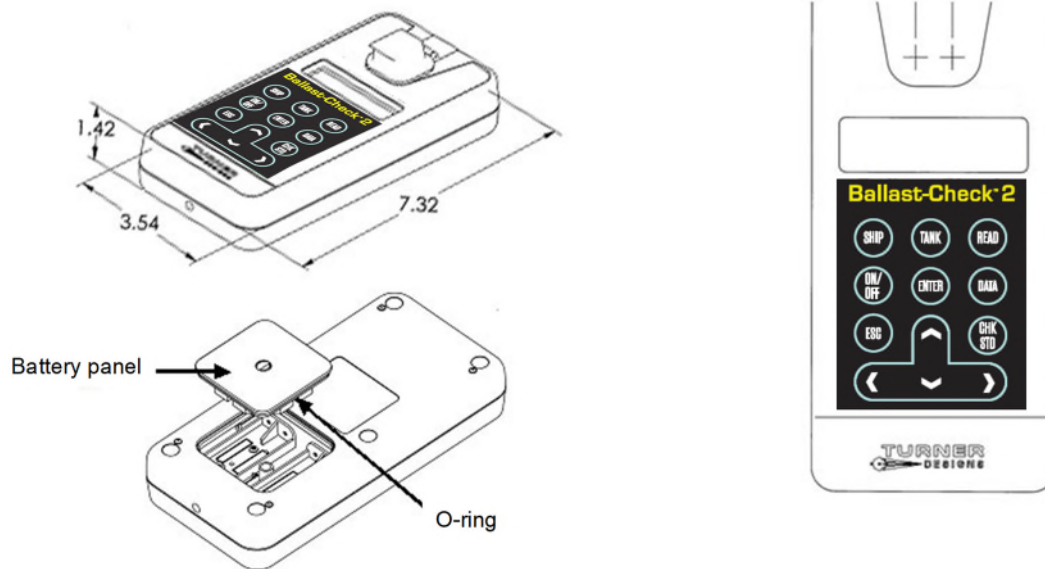
2   Instrument Start Up

2.1 Inspection

Upon receiving your instrument, please inspect everything carefully and make sure all accessories are included. The Ballast-Check 2 package comes in a carrying case that includes:
- Ballast-Check 2 inside a storage pouch (batteries installed)
- Instrument-specific Calibration Check Standard (stored in the interior pocket of the pouch's flap)
- 2 - glass 10x10mm cuvettes
- 60cc plastic syringe
- 3 - 10µm filter capsules
- Filter Washing Kit
- Kim Wipes
- Wrist Strap
- Data download cable P/N 021-0850
- Quick Start Guide, User Manual and Data Report Software on USB flash drive
- Laminated Calibration Certificate
- Laminated Quick Start Guide

2.2 General Information, Precautions and Cleaning
- Use caution around solvents, they may degrade the plastic case of the Ballast-Check 2.
- If a sample is accidentally spilled inside the sample compartment, invert the Ballast-Check 2 to drain out the excess liquid. Wipe the inside area dry with a clean soft towel or tissue followed by a quick wipe using Kim Wipes.
- If extra cleaning is needed, use a mild detergent to dampen the towel for cleaning.
- Although Ballast-Check 2 floats, do not submerge it in water.
- Do not expose Ballast-Check 2 to temperatures outside the specified range of 5 to 40 °C or damage may occur that will not be covered under warranty.

2.3 Instrument Power Up

Ballast-Check 2 is shipped with four standard AAA user-replaceable batteries installed. The plastic battery tab at the back of the Ballast-Check 2 must be removed before use. Grasp it firmly and pull gently to remove it, exposing the battery terminals enabling power to the Ballast-Check 2.
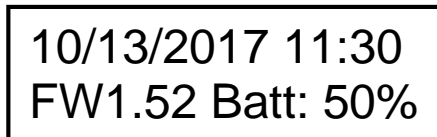
Press the ON/OFF button to power on the Ballast-Check 2. After a 5 second warm up, the Ballast-Check 2 is ready for operation. Pressing the ON/OFF button again will turn the unit off or if left idle for 3 minutes the unit will automatically turn off to save battery power.

Note: Ballast-Check 2 will only automatically turn off if left idle while on the HOME screen.

2.4 Home Screen

The home screen will display the current date, time, Ballast-Check 2 firmware version, and remaining battery power as a percentage. These parameters will be displayed after powering the instrument on and warm up has completed as well as every time the ESC button is pressed to exit to the home screen.

```
10/13/2017 11:30
FW1.52 Batt: 50%
```

Battery power is checked whenever users turn the instrument on using the ON/OFF button. After the 5 second countdown:

- If the battery power is < 20%, the following warning message will display **"Battery <20%! Press <ENTER>".** You can continue making measurements after pressing ENTER.

- If the battery power is < 10%, the following message will display **"Battery Low Pwr! Replace Battery!".** You will not be able to make any measurements until batteries are replaced.

Note: Ballast-Check 2 ships with time in GMT+7. Follow instructions on page 9 to change to your local time.

3.1 Button Identification and Function

SHIP - Displays the ship number or name as a 12-digit alphanumeric value. All characters in the alphanumeric value can be adjusted to set the SHIP number. ↑↓ keys can be used to cycle through numbers 0-9 and characters A-Z. ←→ keys can be used to move the cursor to the next digit. After setting the SHIP number ENTER is pressed to save the value. If ESC is pressed at any time, the screen is exited and nothing is saved.

Saved values are appended to a data point after a sample is analyzed. The sample number will count sequentially, beginning with "#0001" for the first sample analyzed.

TANK - Displays the tank number or name as a configurable 10-digit alphanumeric value. All characters in the alphanumeric value can be adjusted to set a desired TANK number. ↑↓ keys can be used to cycle through numbers 0-9 and characters A-Z. ←→ keys can be used to move the cursor to the next value. After setting the TANK number ENTER is pressed to save the value. If ESC is pressed at any time, the screen is exited and nothing is saved.

Saved values are appended to a data point after a sample is analyzed. The sample number will count sequentially, beginning with "#0001" for each set TANK number. For example, if the TANK value is changed, the sample count will reset to start with "#0001" for that new set of TANK values.

READ - Begins the sample analysis procedure detailed in section 4.4, only if SHIP and TANK values are saved. If SHIP and TANK values are not saved, pressing READ will display the message "First Set SHIP and TANK Values", you will not be allowed to continue with measuring a sample until SHIP and TANK values are saved.

ON/OFF - Turns the instrument ON or OFF.

ENTER - This button is used to save SHIP or TANK values after they have been set and allows users to proceed to the next screen/menu.

DATA – When the DATA button is pressed users can choose between either sending/clearing data or setting date/time. Use the ↑↓ keys to choose between the two options; a marker will indicate the selection made.

If <u>SEND/CLEAR DATA</u> is selected, press ENTER and a submenu will display. Users can choose, using ↑↓ keys, to either send data to a connected computer (see Section 4.7) or clear logged data; a marker will indicate the selection made.

- o If *SEND DATA* is selected and ENTER is pressed, the instrument will send all logged data out as a PDF file (see Section 4.7).
- o If *CLEAR DATA* is selected, the following message will display; "ENTER TO CONFIRM CLEAR DATA"; when ENTER is pressed **all** logged data will be deleted.

If <u>SET DATE/TIME</u> is selected, press ENTER and date and time will display on the screen as (MM/DD/YYYY) and (hh:mm). Use the ↑↓ keys to select either parameter; a marker will indicate selection.

- o If <u>*MM/DD/YYYY*</u> is selected, press ENTER and you will be allowed to adjust the month, date, and year using the ↑↓←→ keys. Press ENTER to save the set date. If ESC is pressed prior to saving the set date, the screen is exited and nothing is saved. Date is logged per sample.
- o If <u>*hh:mm*</u> is selected, press ENTER and you will be allowed to adjust the hour and minutes using the ↑↓←→ keys. Press ENTER to save the set time. If ESC is pressed prior to saving the set time, the screen is exited and nothing is saved. Time is logged per sample.

ESC - Exits to the previous or home screen

CHK STD - Is used to determine instrument performance. "Cal. Check Passed" or "Cal. Check Failed" will be displayed after measuring the Calibration Check Standard using the CHK STD button indicating whether the Ballast-Check 2 can continue to be used for sample analysis or should be returned to the factory.

4   Sample Analysis Approach

4.1 Setting SHIP and TANK Labels

IMPORTANT: Prior to reading a sample, SHIP and TANK labels need to be set.

To set SHIP label; switch on the instrument and press SHIP while on the HOME screen.
1. Use the ←→ arrow keys to scroll to the first desired space.
2. Use the ↑↓ arrow keys to cycle through alphanumeric values 0-Z and then scroll to the next desired space.
3. Press ENTER when done. This label is stored in the datalog and displayed with the data output for each measurement.
To set TANK label; press TANK while on the HOME screen.
1. Use the ←→ arrow keys to scroll to the first desired space.
2. Use the ↑↓ arrow keys to cycle through alphanumeric values 0-Z and then scroll to the next desired space.
3. Press ENTER when done. This label is stored in the datalog and displayed with the data output for each measurement

4.2 Sample Handling Guidelines

* Take care not to spill samples into the sample chamber. Wipe up any spills promptly.

* The cuvette MUST BE DRY on the outside when taking readings. Any moisture or condensation on the outside of the cuvette can affect the reading.

* Fill the cuvette with at least 3.5 mL volume (3/4 full). Significant error in readings may result if the cuvette contains less than this minimum volume.

* Use the same cuvette for your samples; it is very important that you thoroughly rinse the cuvette between samples. Ballast-Check 2 is very sensitive; therefore, cross contamination between subsequent samples will skew results. Three rinses with the sample intended for measurement will help flush out any residual and decrease the chance for cross contamination.

* Do not use a cuvette cap as it may cause the cuvette to seat improperly in the sample compartment.

* When handling the cuvette, hold it near the top.

* Any bubbles in the sample will affect readings. Take care not to introduce bubbles into samples. Remove any bubbles by lightly tapping with your finger on the outside cuvette wall or cover the top of the cuvette and tilt the sample to help dissipate bubbles.

* Wait at least 3 seconds between consecutive measurements to allow the optics to return to normal

4.3 Calibration Verification

Ballast-Check 2 is factory-calibrated and does not require user calibration. Calibration can be checked using the Calibration Check Standard (CCS) included with the instrument. Calibration Check Standards are paired with specific Ballast-Check 2 instruments. To check instrument calibration:

1 Press the ON/OFF button to turn the Ballast-Check 2 ON
2 Locate the Calibration Check Standard (CCS) in the interior pocket of the pouch's flap. Confirm the serial number on the CCS and Ballast-Check 2 are the same.
3 After warm up has completed, holding the CCS by the tab, insert it with the tab at the back end of the sample compartment and close the sample compartment lid
   NOTE: The Ballast-Check 2 should be placed on a flat surface prior to reading the Calibration Check Standard (CCS).
4 Press the CHK STD button
   a. If the calibration is valid, the Ballast-Check 2 will display "Cal. Check Passed"
   b. If the Ballast-Check 2 displays "Cal. Check Failed", remove the CCS from the instrument, re-insert the CCS, press the ESC button and press the CHK STD button to run another calibration check. Repeat this procedure 5 times. If the calibration check fails 3 out of 5 times, you may need to clean the sample well.
      i. Wipe the windows in the sample compartment with a clean dry end of a Q-tip to lightly wipe away any debris or residue from moisture that may be interfering with the measurement.
      ii. Rerun the Calibration Check Standard 5 times while on a flat surface.
      iii. If the Calibration Check passes 3 out of 5 times, the instrument is ready for use.
      iv. If the Calibration Check fails 3 out of 5 times, repeat the cleaning procedure.
      v. Rerun the Calibration Check Standard 5 times while on a flat surface.
      vi. If the Calibration Check passes 3 out of 5 times, the instrument is ready for use.
      vii. If the Calibration Check fails 3 out of 5 times, contact Turner Designs

      NOTE: Temperature change may cause slight variability in the response of the CCS causing the CHK STD to fail. Running the CCS multiple times as described above will account for this variability.
5 Return the CCS to the interior pocket of the pouch's flap.

For a CCS reading, the date, time, serial number, result type, and "Passed/Failed" will be logged to memory. CCS readings are not counted as actual samples, therefore NA (Not Applicable) will be displayed in place of a sample number and all other parameters included in the data output string for the measurement.

4.4 Measuring a Sample

The following materials are required for measuring a sample:

- Ballast-Check 2 Fluorometer
- 60 cc plastic syringe with male luer lock end
- Glass Cuvette
- Kim Wipes for wiping the outside of the glass cuvette
- 10 micron mesh filter capsule
- Filter washing kit
- Deionized or distilled water.

The following procedure is used to measure a sample:

1. Aspirate a small amount of sample into your 60cc syringe to rinse any residual from your previous sample and purge it from the syringe.
2. Aspirate 50cc of sample into your syringe.
3. Using the sample in your syringe, rinse a glass cuvette 3 times, then fill the cuvette ¾ full.
4. Dry and clean all faces of the cuvette using Kim Wipes.
5. Insert the cuvette into your Ballast-Check 2 and close the lid.
6. Turn the Ballast-Check 2 on with the ON/OFF button. Wait 5 seconds for the unit to power on.
7. Press READ.
8. The message "SHIP/TANK OKAY?" will be displayed and you'll be prompted to select "YES" to proceed with measuring or "NO" to return to the HOME screen to enter the correct SHIP and TANK values. To select "YES" press the ENTER key and you will be prompted to press the READ button to continue with the measurement.
9. Press READ and the measurement will begin.
   If LOW risk is displayed, the measurement is complete and you can read Abundance and Activity values for that sample by pressing the ↓ key.
   If HIGH Risk is displayed, you may be prompted to insert a 10 micron sample.
10. Attach a 10 micron filter capsule to your 60cc syringe
11. Remove the cuvette from your Ballast-Check 2 and discard the sample
12. Using the remaining sample in your syringe, rinse the glass cuvette 3 times, then fill the cuvette 3/4 full with your 10 micron filtered sample.
13. Dry and clean all faces of the cuvette using Kim Wipes.
14. Insert the cuvette into your Ballast-Check 2 and close the lid.
15. Press READ. Results will be displayed as HIGH or LOW risk. The measurement is complete. Associated Abundance and Activity values can be viewed by pressing the ↓ key.
16. Remove the cuvette from the Ballast-Check 2 and discard the sample.
17. Remove the 10 micron filter from your 60cc syringe and discard the sample remaining in the syringe.
18. Rinse the syringe 3 times with deionized water.
19. Using the filter washing kit, backwash the 10 micron filter with deionized or distilled water to prepare it for reuse or storage. See Filter Washing Procedure in Section 4.9 for more information on filter washing.

20. When finished viewing data, or if ready to run the next sample, press ESC to get to the HOME screen and repeat sampling procedure.

Note: **It is recommended you repeat the above steps using 3 aliquots from the sample. If you see inconsistent results, please refer to the Sample Handling Guidelines in Section 4.2.**

4.5 Data Displayed and Interpretation of Results

The set fluorescence thresholds in Ballast-Check 2 define values for the Abundance and Activity of algae in the ballast water sample. These correlate to the Ballast Water discharge standard, in IMO/USCG D2, for organisms: less than 10 viable/living organisms/ml in the 10-50 micron size class.

Ballast-Check 2 provides a RISK assessment as either HIGH, for samples that are in exceedance of the discharge standard, or LOW if the sample has not exceeded the discharge standard's requirements. Samples with HIGH RISK will report an Abundance greater than 10 AND an Activity greater than 0.25. If the Abundance is less than 10 OR the Activity is less than 0.25, then the RISK assessment will display as LOW.

The Abundance value represents a count of the algal cells in the sample in cells/ml. The Activity value measures the photosynthetic efficiency (capability of reproduction) of algae in ballast water to assess viability of the algal cells. The Activity is reported as a ratio between 0.01 and 0.75. All values outside of this range are reported as Non-Detect (ND).

The table below shows example readings and advice on restorative action:

Example Readings	Risk	Abundance cells/ml	Activity	Interpretation	Advised action
1	LOW	< 10	< 0.25	Within D2 Guidelines	Maintain BWTS performance
2	LOW	< 10	≥ 0.25	Within D2 Guidelines	Maintain BWTS performance
3	LOW	> 10	< 0.25	Within D2 Guidelines	Maintain BWTS performance
4	HIGH	> 10	≥ 0.25	Exceeds D2 Guidelines	Retest from sample flow. Check BWTS performance. If results remain high, plan for a more detailed analysis at earliest opportunity.

If the sample being analyzed exceeds the upper detection limit of the instrument (> 2,000 cells per ml) then HIGH will be displayed for risk and a value of OVER will be displayed for abundance; Activity will not be valid for this sample and display NA.

Note: You will not be prompted to filter the sample through the 10 micron filter in this case.
This sample will be considered too high to count.

The following parameters are recorded in the order specified below for a single measurement and can be downloaded to a computer after they've been logged:

Date	(MM/DD/YYYY)
Time	(hh:mm:ss)
Serial Number	(85XXXXX)
Result Type	"Sample" or "STD Check"
CHK STD Result	"Passed" or "Failed"
Ship Number	(XXXXXXXXXXXX)
Tank Number	(XXXXXXXXXX)
Sample Number	(1 - 1000)
Risk	LOW, HIGH, NA
Abundance	(00.01 - 2000, "ND", "NA", or "OVER")
Activity	(0.01 – 0.75, "ND", or "NA")

Note: "ND" indicates a Non Detect, meaning the sample is well below the lower detection limit of the instrument. "NA" indicates that the measurement was Not Applicable.

4.6 Viewing Data

Stored data results can be viewed on the Ballast-Check 2 by using the arrow keys.
1. Press the ESC button.
2. If you wish to view results for a specific sample, toggle to that sample using ←→ arrow keys. The sample number is displayed in the bottom right corner of the screen.
3. When the desired sample is displayed use the ↓ key to show the Abundance and Activity values for that sample.

The Ballast-Check 2's memory starts at 100% allowing for a maximum of 1,000 data points to be logged. If the memory is more than 90% full and the READ button is pressed, the following message will display:

"Warning: Memory > 90% Full", indicating you reached more than 90% of the total memory allowed. You will be allowed to continue sampling, but it is highly recommended you stop measuring samples, download data to your PC, and clear stored data.

When memory is full, the instrument will display "Memory Full" and when READ is pressed you will not be allowed to analyze samples until data has been downloaded and cleared from memory using the DATA menu.

4.7 Installing BC2 Data Report Software and Downloading Data

1. Plug the USB flash drive into your computer and wait while USB drivers are installed.
2. Open the USB flash drive folder to view USB flash drive contents.
2 Double click the BC2DataReportSetup.exe file.
3 Follow on screen instructions to finish installing BC2DataReport Software. Before selecting FINISH make sure that the Launch box is checked.

4   If the Launch BC2DataReport box is checked when the install is complete, the program will start automatically. Otherwise, launch the Software by double clicking the

BC2DataReport shortcut or file.

5   Plug the download data cable's stereo jack in the Ballast-Check 2 data port. Make sure that the cable is fully mated with the instrument.

6   Plug the download data cable's USB plug into your computer.

7   Wait for the download data cable's driver to automatically install. This may take several minutes. You will receive the following message when driver installation has completed:
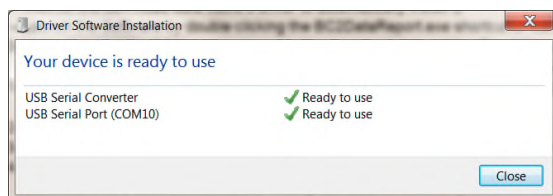
Make sure to note the COM port assigned to the download data cable.

8   Manually enter the COM port number into the Data Report Software's COM port box located in the upper left-hand corner of the software screen. The COM port setting can also be viewed and/or changed in the computer's Device Manager Window.

9   Click the Browse button and navigate to a folder or location where the data report will be saved.

10   Name the file and click Open.

11   Turn the Ballast-Check 2 ON and press the DATA button after warm up has completed.

12   Click Start on the Software screen

   Note: Software window will state, 'Ready for data download'

13   Press ENTER on Ballast-Check 2 to select Send/Clear Data.

14   Press ENTER on Ballast-Check 2 to Send Data.

   Note: Data will begin streaming to the software window.

15   When all data have been downloaded, data streaming will stop.

16   Click the Create Report button.

17   The software window will show 'Creating Report…'

18   When completed, the software window will show 'Report Created!'

19   Click Quit on software screen to exit.

   Note: Data are saved in the format shown in Figure 1 below, as a PDF file, and cannot be modified or changed.

Date & Time	Serial Number	Result Type	CHK STD result	Ship Number	Tank Number	Sample Number	Risk	Abundance	Activity
10/11/2017 9:17	8500022	STD Check	Passed	NA	NA	NA	NA	NA	NA
10/11/2017 9:17	8500022	Sample	NA	H35DF2	2AFT56	1	HIGH	601.23	0.38
10/11/2017 9:18	8500022	Sample	NA	H35DF2	2AFT56	2	HIGH	606.85	0.4
10/11/2017 9:19	8500022	Sample	NA	H35DF2	2AFT56	3	HIGH	595.55	0.42
10/11/2017 9:20	8500022	Sample	NA	H35DF2	2AFT57	1	LOW	21.99	0.2
10/11/2017 9:22	8500022	Sample	NA	H35DF2	2AFT57	2	LOW	25.31	0.18
10/11/2017 9:23	8500022	Sample	NA	H35DF2	2AFT57	3	LOW	19.56	0.21

Figure 1.

The PDF file will contain the date the report was created and signature fields for service provider (representative and company), ship representative, and a field for manually entering the overall stated risk level.

NOTE: MAKE SURE THE REPORT CAN BE VIEWED OR PRINTED FROM YOUR SAVED FILE BEFORE CLEARING DATA FROM THE BALLAST-CHECK 2.
It is recommended that you clear all data from the Ballast-Check 2 after creating and printing a report.

4.8 Creating Reports Using BC2 Data Report Software

♦ Once the software is installed and working properly, launch the BC2 Data Report

  Software by double-clicking the software icon .
♦ Plug the download data cable's stereo jack into the Ballast-Check 2 data port ensuring it is fully mated with the instrument.
♦ Plug the USB end of the download cable into your computer.
♦ Follow steps 8 through 19 from Section 4.7 to create a data report.

4.9 Filter Washing Procedure

Included in the Ballast-Check 2 package is a 10 micron filter washing kit to rinse the 10 micron filters after use. The 10 micron filters can be reused many times if properly rinsed after each use.
1. Locate the filter washing kit.
2. Attach the plastic tube included in the filter washing kit to the 5cc plastic syringe.
3. Obtain deionized or distilled water.
4. Fill the 5cc syringe by drawing water from the deionized or distilled water.
5. Attach the other end of the plastic tube to the outflow port of the 10 micron filter holder.
6. Make sure there is nothing attached to the inflow port of the 10 micron filter holder.
7. Push water through the filter to remove any materials trapped on the nylon mesh.
8. Repeat as necessary as determined by visual inspection.

When finished sampling and prior to storage follow the procedure above to ensure filters are clean. If they are not properly rinsed using clean water prior to storage, filter damage may occur.

5 Warranty

5.1 Terms
Turner Designs warrants the Ballast-Check 2 Fluorometer and accessories to be free from defects in materials and workmanship under normal use and service for a period of 12 months from the date of shipment from Turner Designs, with the following restrictions:

- Turner Designs is not responsible for replacing parts damaged by accident or neglect. Damage from corrosion is not covered. Damage caused by customer modification of the instrument is not covered.

- This warranty covers only Turner Designs products and is not extended to equipment used with our products. We are not responsible for incidental or consequential damages, except in those states where this limitation is not allowed. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

- Damage incurred in shipping is not covered.

5.2 Warranty Service
To obtain service during the warranty period, the owner shall take the following steps:

1   Write, email, or call the Turner Designs Technical Support department and describe as precisely as possible the nature of the problem.

> **Phone**: 1 (877) 316-8049
> **Email**: support@turnerdesigns.com

2   Carry out any adjustments or tests as suggested by the Technical Support Department.

3   If proper performance is not obtained you will be issued a Return Authorization number (RMA). Package the unit, write the RMA number on the outside of the shipping carton, and ship the instrument, prepaid, to Turner Designs. If the failure is covered under the warranty terms, the instrument will be repaired and returned free of charge, for all customers in the contiguous continental United States.

For customers outside of the contiguous continental United States who purchased equipment from one of our authorized distributors, contact the distributor. If you purchased directly, contact us. We will repair the instrument at no charge. Customer pays for shipping duties and documentation to Turner Designs. Turner Designs pays for return shipment. Custom duties, taxes and fees are the responsibility of the customer.

5.3 Out-of-Warranty Service
Follow steps for Warranty Service as listed above. If our Technical Support department can assist you by phone or correspondence, we will be glad to, at no charge. Repair service will be billed on a fixed price basis, plus any applicable duties and/or taxes. Shipment to Turner Designs should be prepaid. Your bill will include return shipment freight charges.

Address for Shipment:
Turner Designs
1995 N 1st Street
San Jose, CA 95112-4220
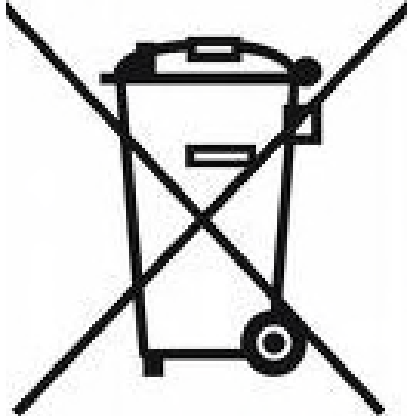
Appendix A: Specifications

Ballast-Check 2	
Sensitivity	< 10 cells/ml
Warm Up Time	5 seconds
Power	4 AAA standard or rechargeable batteries
Auto Power Off	After 3 minutes of inactivity
Light Source	LED
Detector	Photodiode
LCD Display	2 x 16 characters
Resolution	12 bits
Case	Meets IP 67 Standard; dustproof and waterproof
Temperature	41-104 °F; 5-40 °C
Internal Memory	1,000 records
Data Report Format	PDF
Weight	0.87 lbs. (0.4kg)
Size	1.75" x 3.5" x 7.25"(4.45cm x 8.9cm x 18.4cm)

Appendix B: Error Readings and Warning Messages

__Memory Warning Messages__

The Ballast-Check 2's memory starts at 100% allowing for a maximum of 1,000 data points to be logged. If the memory is more than 90% full and the READ button is pressed, the following message will display:

"Warning: Memory > 90% Full"

Indicating you reached more than 90% of the total memory allowed. You will be allowed to continue sampling, but it is highly recommended you stop measuring samples, download data to your PC, and clear the data log.

When memory is full, the instrument will display:

"Memory Full"

When READ is pressed you will not be allowed to analyze samples until data have been downloaded and cleared from memory.

__Error Readings__

When samples are below set blank values, the instrument will result in an Error Reading indicating that there is no fluorescence associated with the sample being read. When this occurs, users should read the sample 2 more times for repeatability. Error readings are logged to memory and will be counted as samples. However, logged values (Risk, Abundance, Activity) for error readings will display NA indicating that the instrument wasn't able to measure the sample.