

SOP 7: Post-cruise Quality Assurance: Raw Data Plots version 2

Summary

As soon as cruise data become available on the park network after completion of SOP 5, the performance of the CTD is reviewed by generating a set of profile plots from all of the HEX files. Sea-Bird SBEDatapro.exe software is used. Due to the number of parameters recorded, each cast requires two JPEG file plots in order to display all values.

It is important to perform this procedure immediately after each cruise, so the leader can detect faulty performance of individual sensors in time to complete repairs before the next cruise. (This quality check does not, however, replace the visual file inspections performed in SOP 5. Incorrect length data lines detected in SOP 5 typically indicate defects in the CTD hardware, firmware, and/or configuration but not in individual sensors.)

This process is the responsibility of the project leader. The plots are intermediate products local to the park and are not a formal SEAN deliverable. They are, however, required so the project leader may create the OC_M data quality evaluation deliverable at season's end.

If multiple CTDs were used during a cruise year (or one CTD was reconfigured during the year), this process must be run once for each CTD file set. Because calibration files are specific to a particular CTD and instrument set, the hex files must be segregated in order to be associated with their one proper calibration file.

Note: before executing this procedure, it may be helpful to review Appendix H regarding standard directory structures and Appendix I regarding Sea-Bird software layout.

SOP 7 requires users to work in the internal NPS network under valid Active Directory accounts. Access questions should be directed to the data manager.

Detailed Steps

A. Be aware of limitations inherent in software.

1. This process may be performed at the park or at any location physically connected to the NPS network.
 1. If executed outside the immediate park, it may take a great deal of time to complete due to GLBA's very slow network connection combined with the large amount of data involved.
 2. Be aware execution from outside could also slow Internet response to all park staff as the bandwidth saturates.
 3. If this must be performed outside the park, it is best done via remote desktop connection to a suitably configured computer physically located in the park.
2. The workstation used must have special SBEDATAPROC.EXE software and custom scripts installed.
 1. The custom scripts are required to automate a complex set of data processing steps.

2. If not found on the Windows desktop, seek Data Manager's assistance.
3. There are separate scripts for different CTDs, as well as for the same CTD that has had a significant change to its instrument configuration.
3. The software may present message boxes and halt until the operator issues commands to continue.
 1. Sometimes these messages do not appear in the foreground of the desktop but are hidden behind other windows.
 2. To limit hidden windows, it is advisable not to work with other software, such as web browsers, while this process is being performed.
4. The vendor software does not permit rigorous exception recovery.
 1. The applications may fail due to a number of circumstances.
 2. Familiarity with the Sea-Bird data processing applications will aid in diagnosing and overcoming problems.
 3. As of this writing, the authoritative manual may be found at http://www.seabird.com/pdf_documents/manuals/SBEDDataProcessing_7.23.2.pdf.
 4. The Data Manager is available to assist in resolving software issues.

B. Be certain appropriate CON file(s) are present in the cruise year's folder.

1. The folder is \\files.glba.nps.gov\science\data\oceanography\data\YYYY\CON_calibration\
2. [It is desirable, but not essential, that the CON files used here be certified OC_A products \(SOP 3\).](#)
3. [If there are multiple CTD configurations used within one cruise year, a separate CON file for each configuration needs to be in place.](#)
4. The particular CON file to use for a particular CTD configuration is the one whose internal content is consistent with all the sensors for the CTD and is the most recently created one prior to the cruise. See SOP 3 and Appendix J for details regarding how to interpret the internal content of CON files.
5. The CON_calibration folder may have additional CON files present for other purposes. Do not delete any CON files.

C. Be certain the HEX cast data files from the most recent cruise are present.

1. They must be in \\files.glba.nps.gov\science\data\oceanography\data\YYYY\hex_raw\, where YYYY is the year of interest.
2. Be sure there are no empty HEX files, as explained below, in the directory named \\files.glba.nps.gov\science\data\oceanography\data\YYYY\HEX_raw\. Empty HEX files will halt the automated processing.
 1. Use Windows Explorer to find any files that are too small to contain data points.
 2. Navigate to \\files.glba.nps.gov\science\data\oceanography\data\YYYY\hex_raw\, where YYYY is the year of interest.
 3. Locate any file whose size is 2 KB or smaller.
 4. Open each small file with NOTEPAD.EXE or similar program to verify whether rows of hex data follow the line containing *END*.
 5. For each file with no data, use Windows Explorer to rename it by appending a ".BAD" extension.

1. E.g., rename a file called 0903_1_0178_00.HEX to 0903_1_0178_00.HEX.BAD.
2. This will effectively hide it from plot processing.

D. Generate plots from all HEX files

1. Verify the required directory structure is established for the year. There must be a \\files.glba.nps.gov\science\data\oceanography\data\YYYY\plot\HEX\temp directory available to generate work files in. Create it if necessary.
2. Be sure the ...\HEX_raw\ folder contains files from no more than one CTD configuration.
 1. Plots will reflect all hex files in the folder processed using a single specified calibration file.
 2. The calibration file specified must be appropriate to the CTD used.
 3. If multiple CTD configurations were employed, this plot generation function must be performed separately for each CTD, and the ...\HEX_raw\ directory must have only a single CTD's files copied into it during each iteration.
 1. Accomplish this by moving the HEX files irrelevant to processing against a particular CON file out to a temporary folder.
 2. Never delete any HEX files! These are the only copies of original data and may not be recoverable if deleted.
 3. After iterating through the multiple CTD configurations, be sure all the original HEX files are back in the \\files.glba.nps.gov\science\data\oceanography\data\YYYY\hex_raw\ folder
3. Be sure the directory \\files.glba.nps.gov\science\Data\Oceanography\Data\YYYY\Plot\HEX\temp\ has no files in it. Existing files from a different CTD may confuse the plotting software. Use Windows Explorer to delete any files that may be left over from earlier operations.
4. Invoke the automation scripts by double-clicking the provided desktop icon or, if no icon is available, by double-clicking its BAT file in Windows Explorer.
 1. Each CTD configuration has its own version of the script. For example, CTD 1 uses C:\Program Files\Sea-Bird\#1HEX_Plot.BAT. CTD 5 uses C:\Program Files\Sea-Bird\#5HEX_Plot.BAT (Figure SOP 7.1).

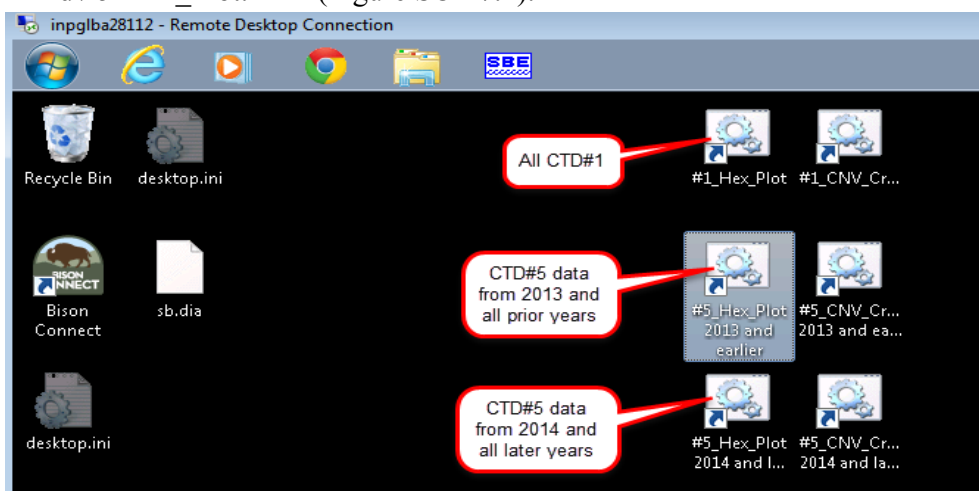


Figure SOP 7.1. In order to successfully plot raw data, one must invoke the application appropriate to the particular CTD configuration used.

2. Details of program configuration are provided in Appendix I.
5. A DOS command window will appear and prompt the user for parameters.
 1. Provide the four-digit cruise year in response to the prompt.
 2. Enter the name of the calibration file to use.
 1. Generally, this is the file most current at the beginning of the survey year.
 2. Enter the filename and extension only.
 1. For example, 1_0436a.CON
 2. Do not attempt to specify any directory information. The locations of calibration files for each year are predefined.
 3. The file form to use up through 2013 is the CON file.
 4. Beginning in 2014, Sea-Bird XMLCON format files should be used.
 3. The process may appear unresponsive, with no visible indication of activity, but it is running. Be patient.
6. A Windows dialog box will appear titled “Data Conversion.”
 1. It shows parameters used and provides the status of file processing.
 2. As long as file processing progress is shown, nothing should be touched in the dialog box.
 3. Message boxes indicating errors in a particular file may appear.
 1. The messages are terse but do explain the nature of problems.
 2. Generally, they can be dismissed by pressing the OK button.
 3. If presented with a message box asking “Do you want to process the next file?”, one may generally press “YES.” A few defective files should not be grounds for cancelling all plots.
 4. If presented with the message “Output file already exists,” click on the “Yes to all” button.
 4. It will be over when the dialog box disappears.
7. Nothing will appear for a while, but the first set of plots, the “A” group, is being assembled.
 1. Once the software has looked at every HEX file for the year, it may display a message box warning of errors in certain files.
 1. Files exhibiting errors will not be plotted.
 2. Press the OK button on the message box to continue.
 3. Be aware this box may be hidden beneath other windows and that processing will not resume until OK is pressed.
 2. A Windows form titled “Sea Plot” will eventually appear.
 1. It should display a progress bar as it plots each file.
 2. One may monitor the creation of JPG plot files by watching files get added to the ...YYYY\plot\hex\ directory (Figure SOP 7.2):

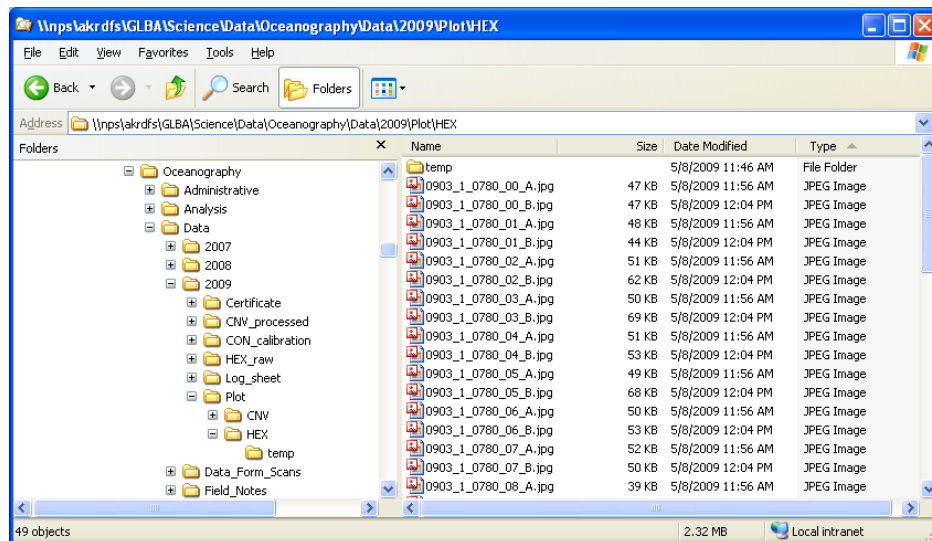


Figure SOP 7.2. Using Windows Explorer to monitor plotting progress.

3. When complete, the software may display a temporary plot viewing window, which should be dismissed.
4. Once the A plot files are complete, the dialog box will disappear.
8. Nothing will appear again for a while, but the second set of plots, the B group, is being assembled.
 1. The considerations and actions are the same as those in the previous step.
 2. After the B plots complete, the original command box should automatically disappear as well. If it doesn't, type "EXIT" in that box to dismiss it.

E. Review plots for indications of problems.

1. They may typically be viewed in Windows Explorer by double-clicking on a JPG filename in `\\files.glba.nps.gov\science\Data\Oceanography\Data\YYYY\Plot\HEX`. The application that pops up showing the first file typically supports scrolling through the other files in the directory. Figure SOP 7.3 illustrates this.
2. The plot files follow the same file naming convention as the HEX files, but have an `_A` or `_B` appended, indicating which parameter set they show.
3. Audit the count of plot files. Missing plot files are usually the result of damaged corresponding HEX files, which should be investigated.
4. Erratic plots of only one parameter suggest a faulty sensor in need of correction. However, outlier values only at the top of the cast are to be expected, as the CTD may start recording before being fully submerged and acclimated (Figure SOP 7.4).
5. Unexpected plots of multiple parameters, particularly if they occur on multiple casts from a particular time forward, suggest a systemic CTD failure (Figure SOP 7.5).
6. Operational error may also result in unusable readings (Figure SOP 7.6).

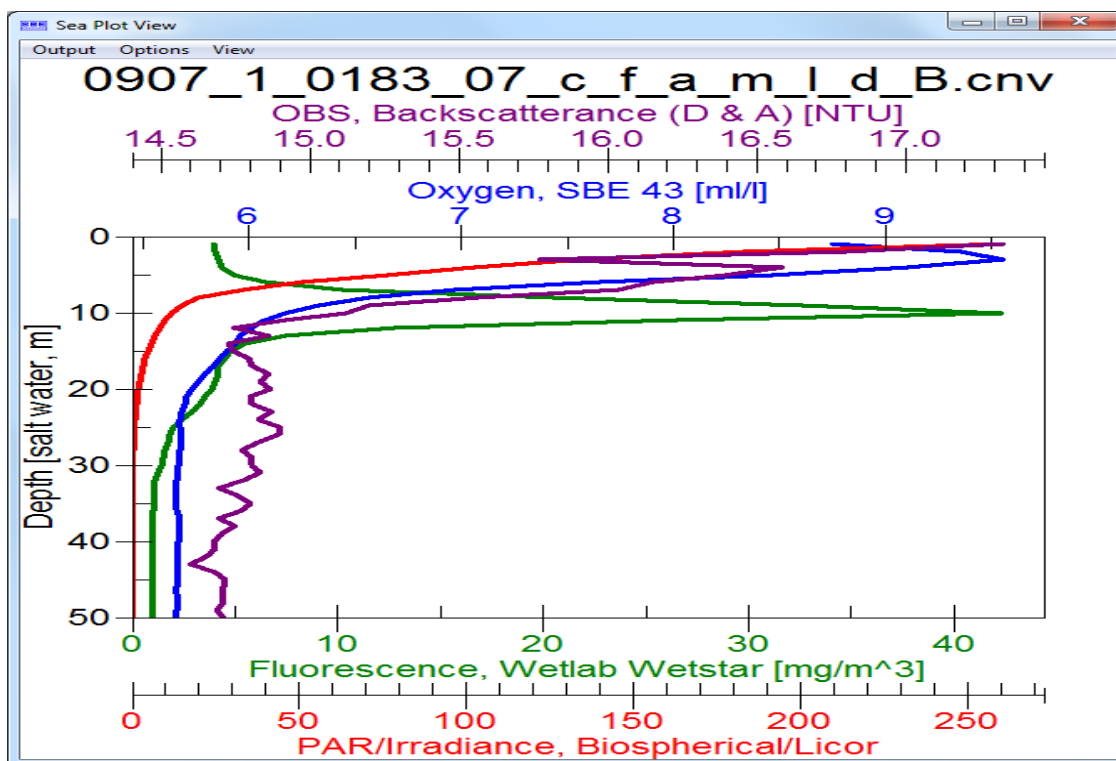
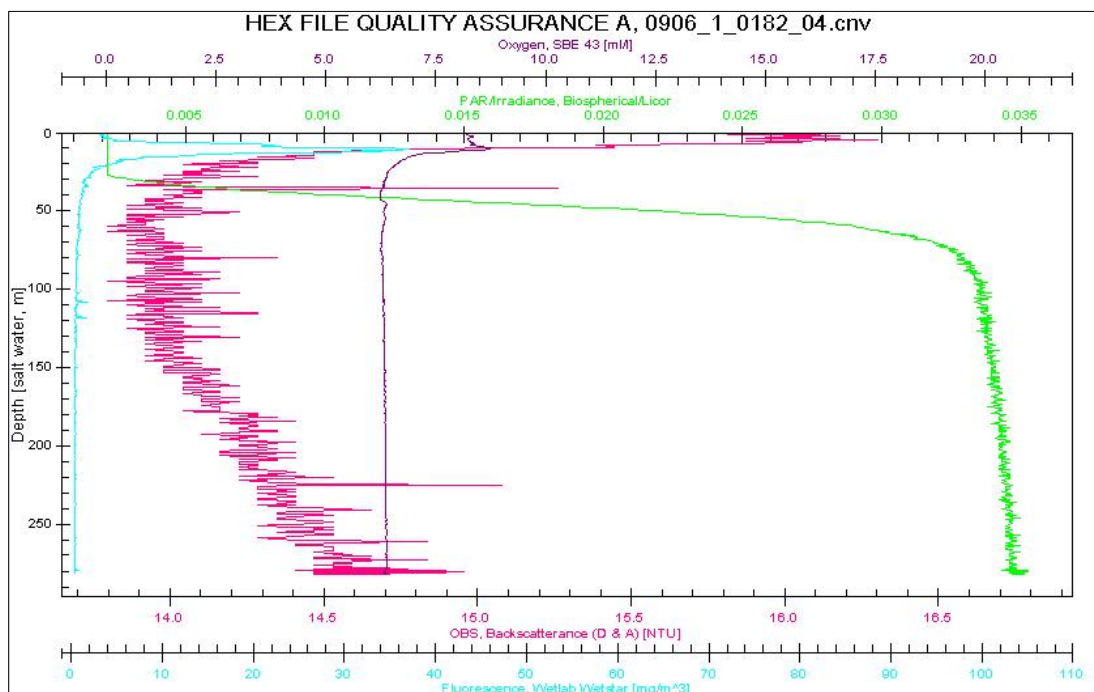


Figure SOP 7.3. Normal vertical profile plot of density, OBS, fluorescence and PAR.



SOP 7.4. Raw data profile plot illustrating an example of one faulty sensor. The PAR signal, measuring light intensity, should not be increasing with depth. A defective connector was the cause of this aberration. The cruise's subsequent casts were similarly flawed. Postcruise analysis of the HEX plots alerted the project that instrument repairs were required.

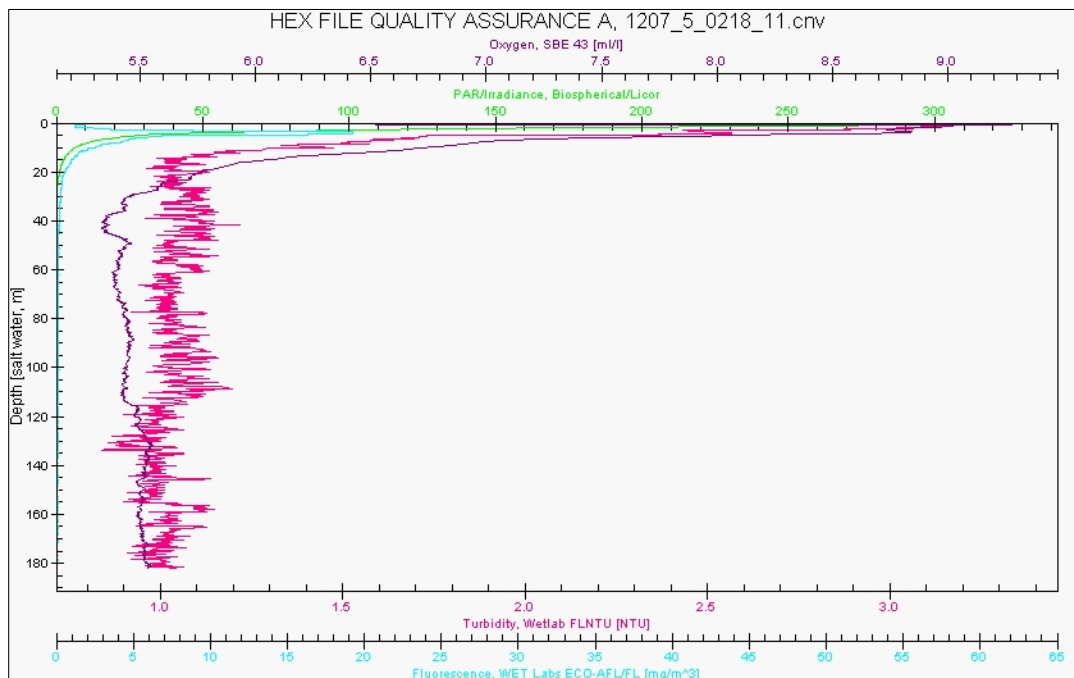


Figure SOP 7.5. Raw data profile exhibiting unexpected values. Cause was determined to be failing batteries affecting the entire CTD.

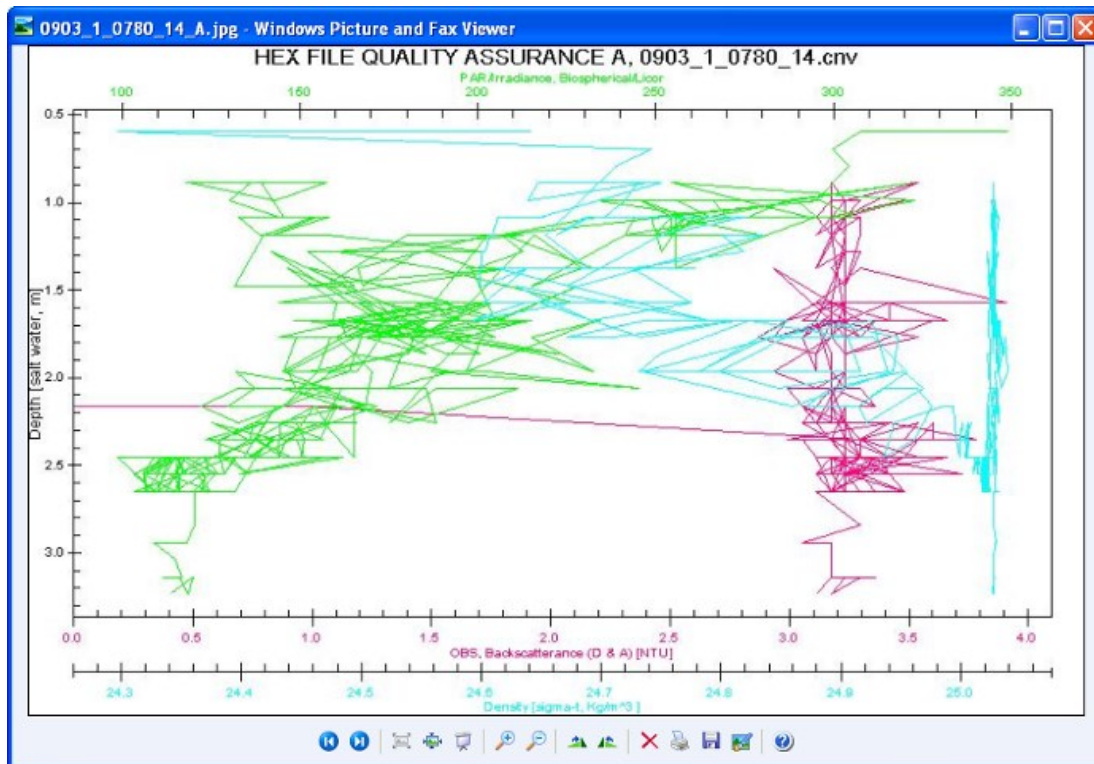


Figure SOP 7.6. Raw data profile plot illustrating a bad cast. In this case, the CTD only recorded the top 3 m of the column. Data show the measurements “settling” as the pump comes on and the data values approach steady readings during the soak period.

F. Retain the plot files for year end.

1. They will be required for determining data quality when deliverable OC_M is built at the end of the cruise year.
2. If accidentally deleted, they will be recreated the next time this process is run after another cruise. The automated process always plots all HEX files in the year's folder for a particular CTD configuration.
3. The .../YYYY/Plot/HEX/temp directory is used to store intermediate files integral to this process.
 1. These files are not intended to be used for any other purpose.
 2. They are not managed as formal deliverables and should be considered ephemeral.