



Ocean Networks Canada

Ferry Maintenance Report – Queen of Alberni

Date: March 6, 2015

Arrival: 12:45AM sailing to Tsawwassen. We signed in at terminal supervisor at Duke Point.

Reporter: Chris Sundstrom, Ian Beliveau (Servicing), Akash Sastri (Science Analysis)

Attending Personnel: Chris Sundstrom, Ian Beliveau (ONC-Operations), Akash Sastri (ONC Science)

Reason for Visit

Refit unit with replacement plumbing hardware. Monitor leak issue. Replace radiometer equipment.

Observations

1. There was evidence of leaking within the Instrument Box. Most of the lower box was coated in water spray and approximately 8 liters of water were in the catchment box. This water was apparently from leakage in the system.
2. The BBFL2 feed water tubes had been connected backwards during the last servicing, resulting in the BBFL2 operating with minimal water in the sample volume. All data since the previous servicing is to be marked invalid.

Actions Taken

1. The system was operating upon arrival.
2. The upper and lower boxes were opened and system operation was observed. The reversed feed tubes to the BBFL2 were noted at this time. Water was evident within the housing and in the catchment basin. Some of this water was evidently from condensation, but most was from apparent leaks.
3. Switched off the system and proceeded with normal instrument cleaning and calibration procedures.
4. Minor sedimentation was observed within all instrument housings. The BBFL2 housing was almost entirely empty of water, only containing enough water to fill to the lower (incorrectly exit) port.



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5. Examined the lower plumbing system. Removed the hard plastic tube and compression fittings to replace with barb fittings. During disassembly, noted crack in elbow joint below the manifold which became evident only under certain lighting conditions.
6. Replaced the lower plumbing system between the pump and the manifold with two barb fittings and flex tubing.
7. Reassembled system.
8. Turned system on, pump would not start, orange LED lit. Checked manual, determined with multimeter that the leak sensor was corroded, replaced leak sensor.
9. Turned system on and operation was noted as normal. No leaks immediately evident.
10. Checked and cleaned the Sea Strainer unit.
11. Proceeded to upper deck (monkey's island, 2nd bridge).
12. Attached StarBoard sheet with Campbell Scientific Logger box to the railing. NOTE: next trip, replace bolts with longer units and more complete hardware set.
13. Reattached radiometers to mounting plate. NOTE: next trip, bring additional 6mm hardware and resecure.
14. Rewired all radiometer systems into the upper electronics boxes.
15. Signed out at Engineering room.

Future Actions

1. Inspect new plumbing for leaks.
2. (Long term) Replace outlet pipe with flex tubing as well (pass-through manifold block to be designed).
3. Resecure radiometers and StarBoard panel with new hardware.
4. Photograph new radiometer equipment (insufficient time this trip).
5. Install new dessiccant packs in instrument housing.
6. Purchase extended length Allen keys for disassembly of pump control box.

Discussion of Test Procedures and Results

The test procedures used are documented in the supplemental report, which also provides preliminary analysis of the data and its consequences.

Pictures:



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Figure 1: System upon arrival

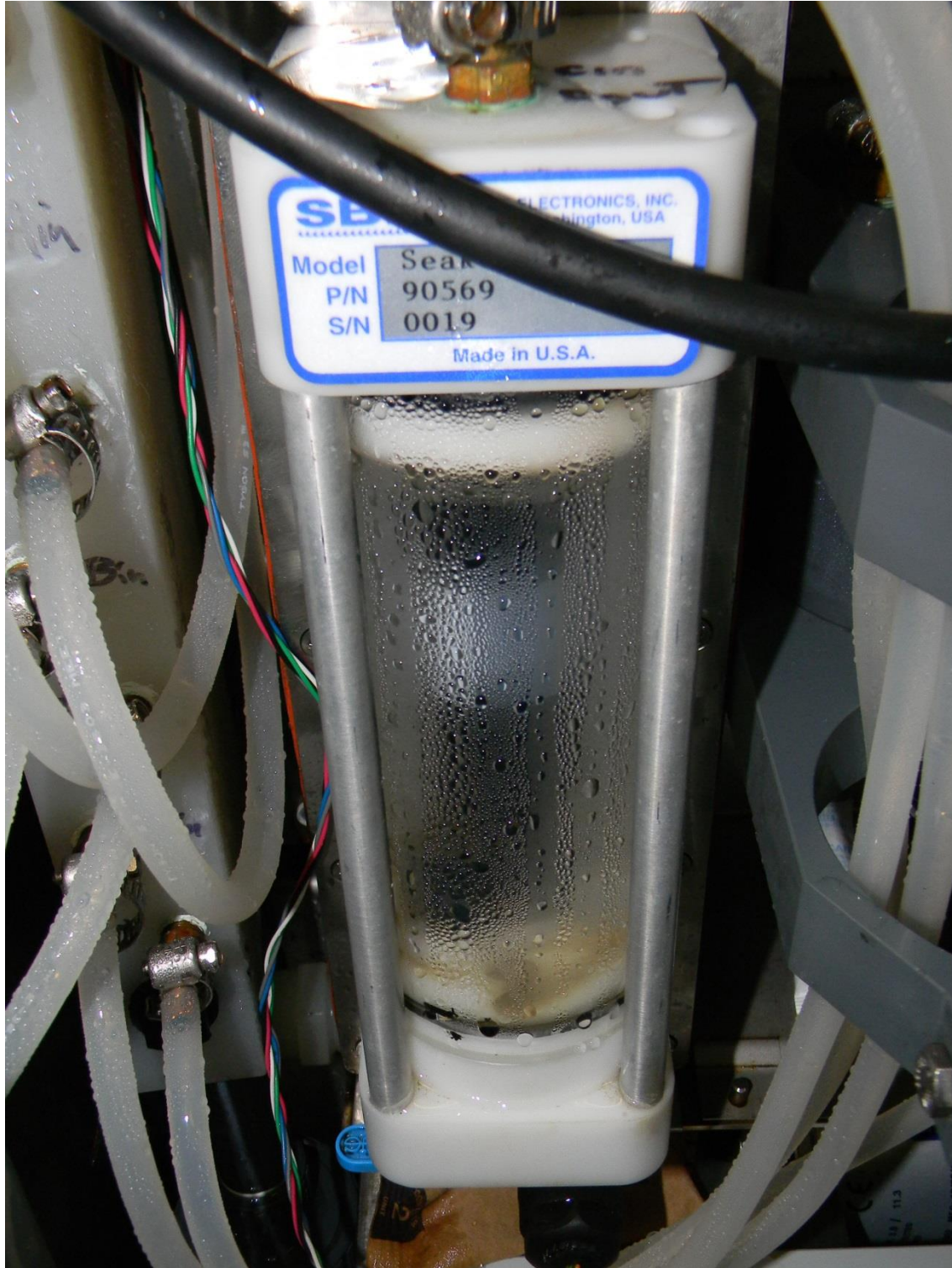


Figure 2: Moisture on CT unit



Figure 3: Moisture on top of pump control box

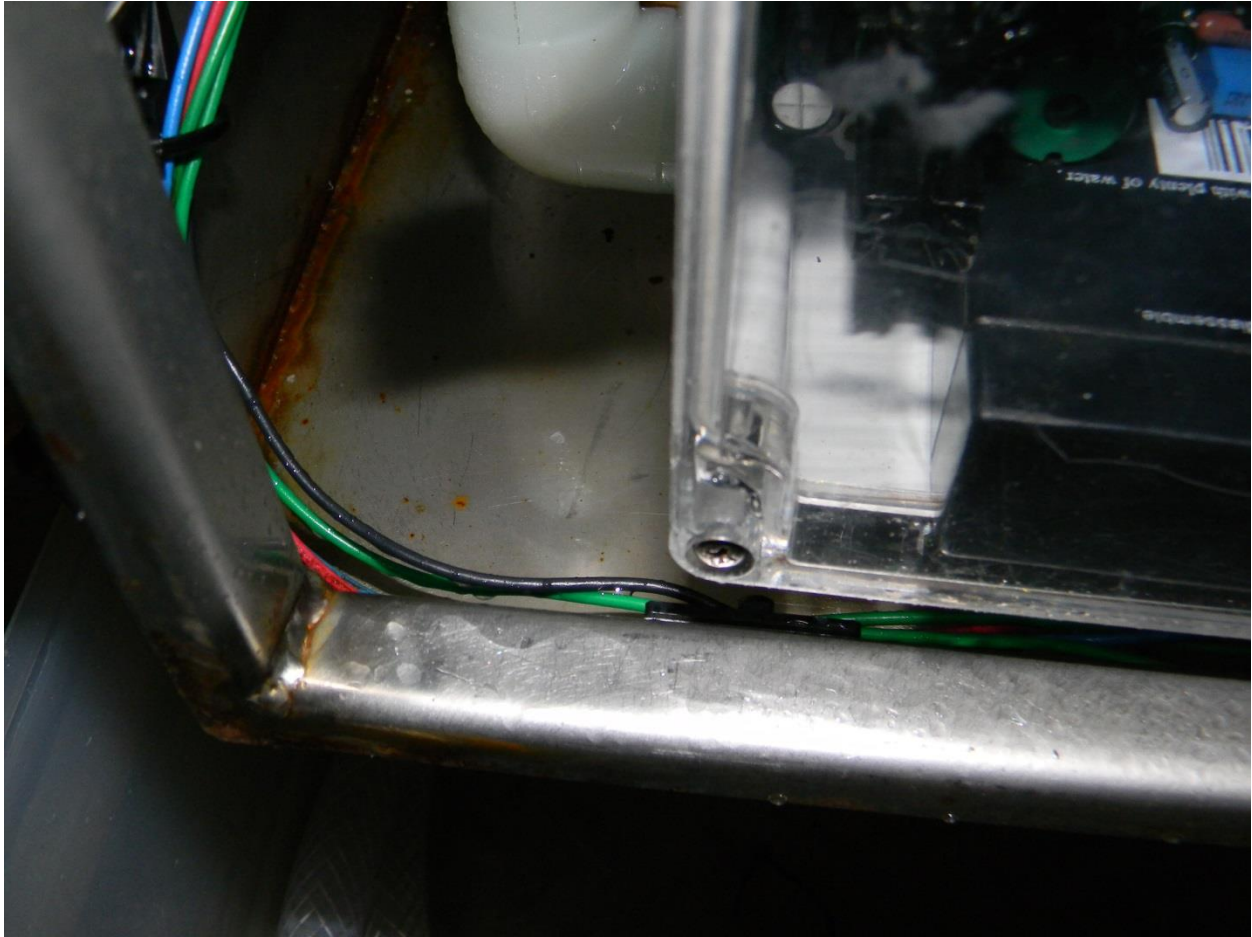


Figure 4: Moisture in bottom of instrument box

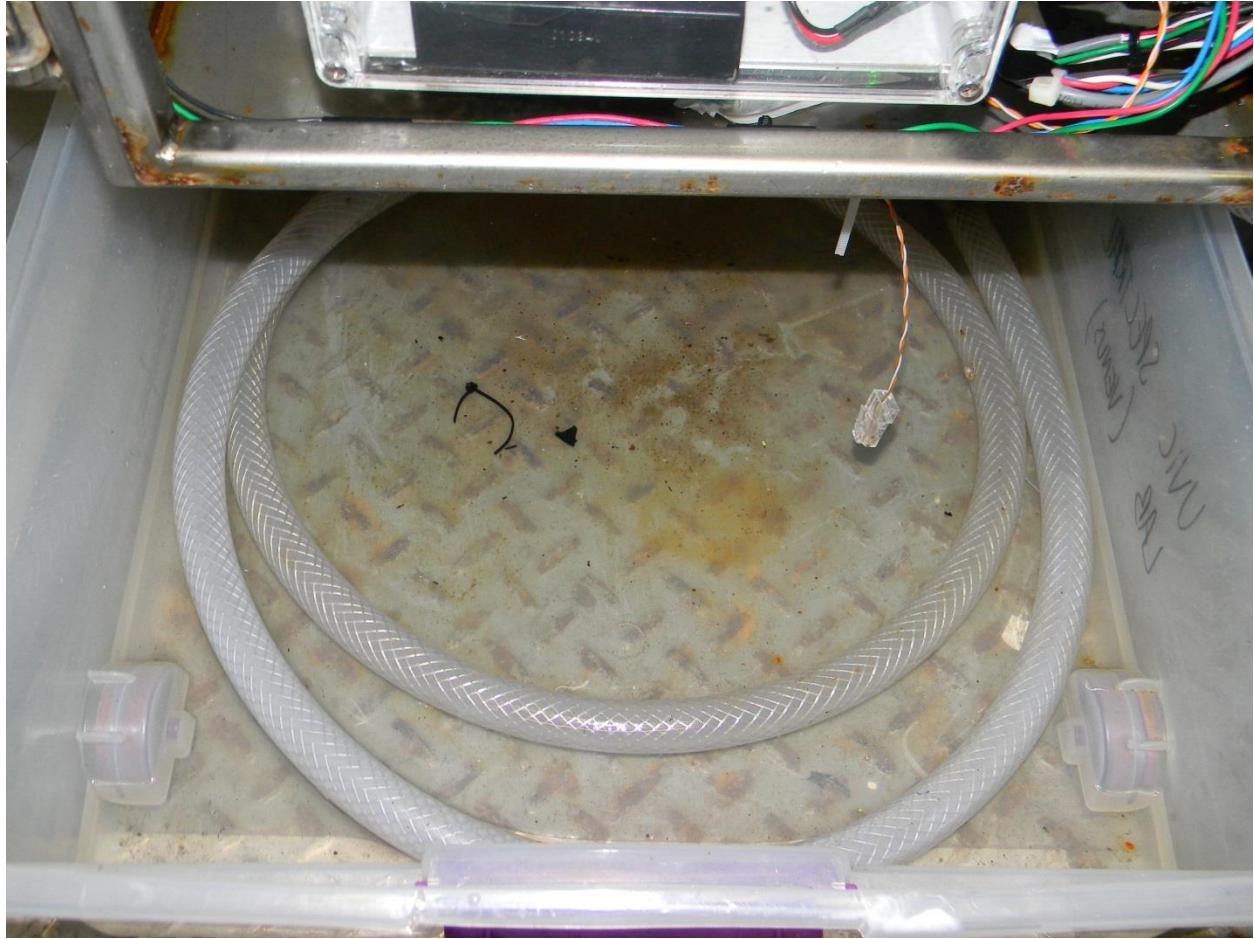


Figure 5: Collected water in catchment basin

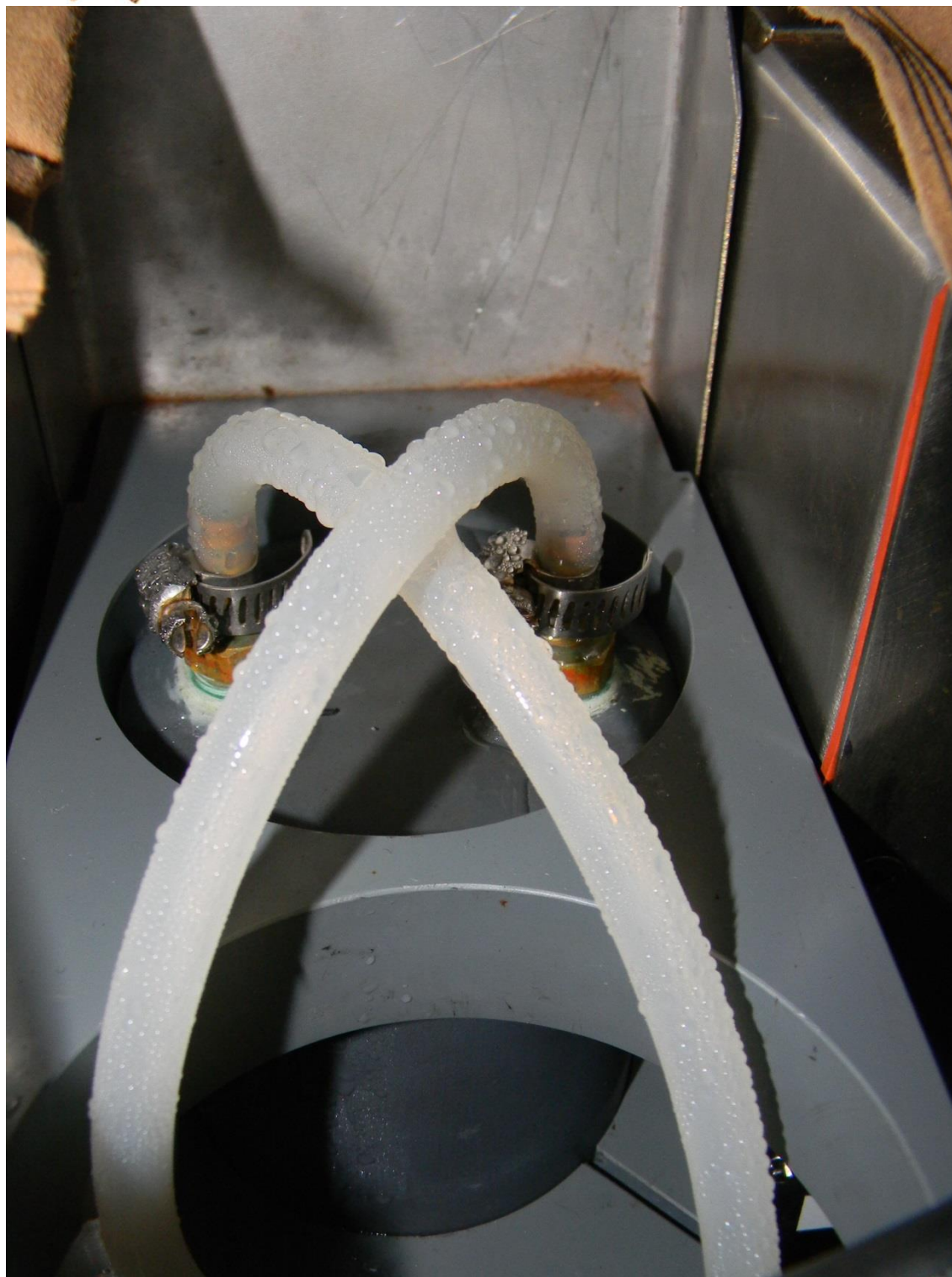


Figure 6: Moisture on top of Optode



Figure 7: Minor sediment build-up within CT housing



Figure 8: Minor sediment buildup within Optode housing



Figure 9: Minor sedimentation inside BBFL2 housing (on bottom where slight water levels were possible)



Figure 10: Cracked elbow joint (arrow indicated faint crack line). The crack extended past the threaded region to the unthreaded region.



Figure 11: Replacement barb fitting and flex tubing (manifold end)



Figure 12: Replacement barb fitting and flex tubing (pump end)



Figure 13: Sea Strainer

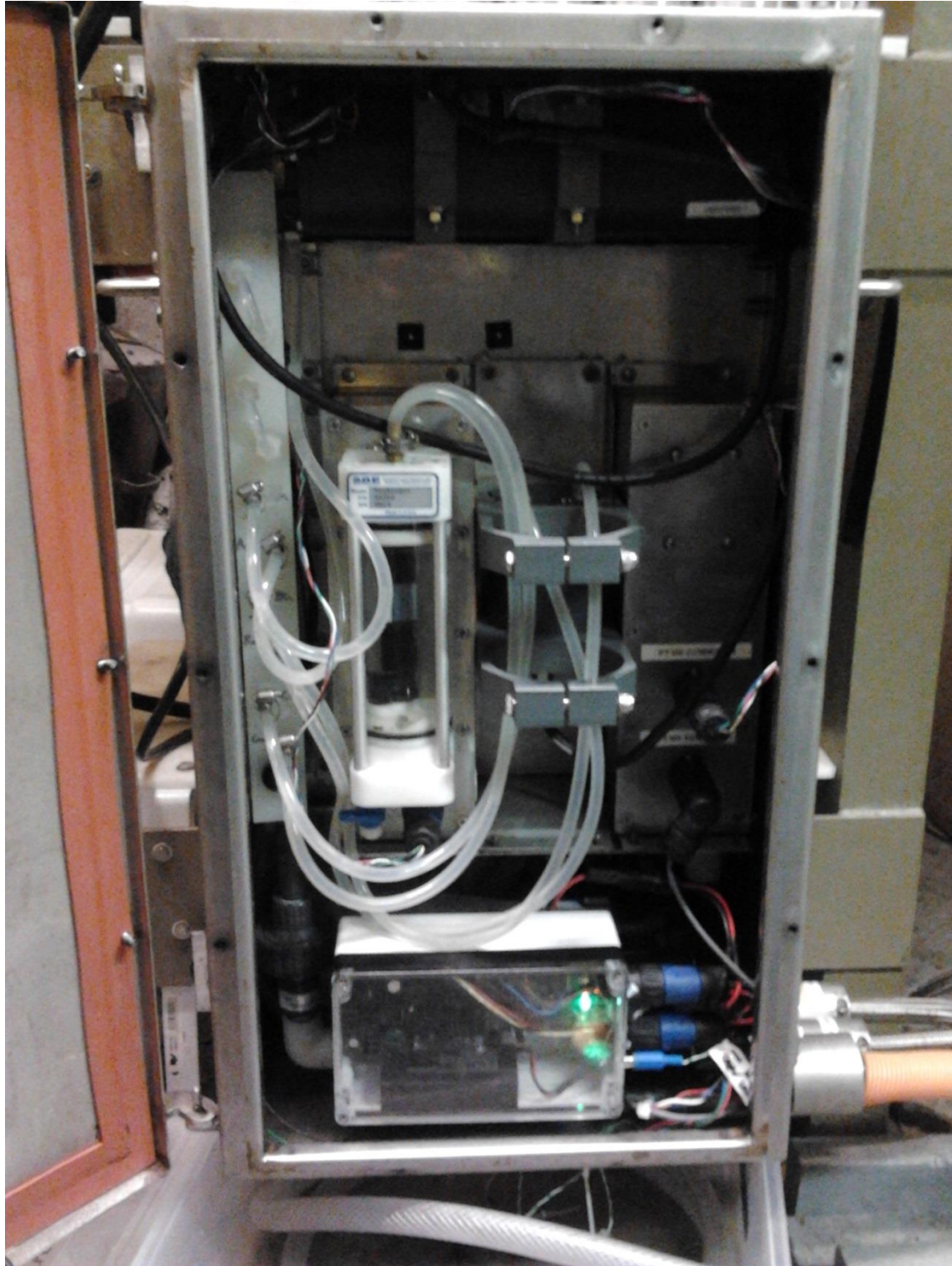


Figure 14: Instrument box upon completion



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Table 1. March 6, 2015. Mean (\pm standard error) values of pre- and post-cleaning fluorescence for solutions/fluorescent sticks specific to CDOM and Chlorophyll fluorescence. ‘ Δ fluor’ values for Diet Coke (Chl) and diluted tonic water or Sprite Zero (CDOM) have been used at every cleaning since March 14, 2014 to assess the degree of signal decay between cleanings. The post-cleaning fluorescence values for the pink and blue sticks were greater than pre- values, though these differences are probably of limited value given the unreliable nature of this approach. The BBFL2 was effectively running “dry” between February 27 and this maintenance trip. We had little expectation of fouling. Results for both Sprite Zero and Tonic was reflect limited or no biofouling. Diet coke (Chlorophyll fluorescence) was slightly (~ 0.016) greater post-cleaning, again suggesting limited fouling since the 27th of February.

| CDOM/Chl Fluorescence | Method | Pre- (mean \pm SEM) | Post- (mean \pm SEM) | Δ fluor (%) |
|-----------------------|------------------------|-----------------------|------------------------|--------------------|
| CDOM | Diluted tonic water | 20.53 \pm 0.014 | 20.47 \pm 0.026 | -0.003 |
| CDOM | Sprite Zero | 44.93 \pm 0.014 | 44.52 \pm 0.15 | -0.009 |
| CDOM | Blue fluorescent stick | 67.39 \pm 0.08 | 135.49 \pm 0.50 | 0.502* |
| Chl | Diet Coke | 5.49 \pm 0.003 | 5.58 \pm 0.017 | 0.016 |
| Chl | Pink fluorescent stick | 7.29 \pm 0.004 | 7.71 \pm 0.010 | 0.055 |



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Table 2. Comparison of oxygen saturation/zero oxygen values (January 23, 2015 and March 6, 2015) for the optode currently deployed aboard the Queen of Alberni (#418; 2-point lab calibration on December 19, 2014) Mean and standard errors of the means were calculated on values recorded when instrument output stabilized following immersion of the optode into either oxygen saturated (bubbled) or zero oxygen (sodium thiosulfate addition to the saturated solution) water.

| | January 23, 2015 (mean± SEM) | March 6, 2015 (mean± SEM) |
|---------------|---|--|
| 100% solution | 99.92±0.320 | 101.15±0.022 |
| 0% solution | 0.320±0.0001 | 0.69±0.0046 |