BML/CBNMS CTFX Mooring Protocol

Locations
The mooring is located at Cordell Bank, CA, about 25 miles offshore of Pt. Reyes.

Design
The buoy itself is a 30-in in diameter spherical steel buoy with a foam core. It is lighted, and has a 500 lb steel anchor, with a Danforth anchor as a safeguard against anchor movement. Acoustic pinger tags are attached to both the anchor and the instrument package. The mooring rode employs a 1.8:1 scope, and is similar in design to the reverse catenary mooring, in that the top half of the line is meant to sink, while the bottom half is meant to float , thus creating an "S" shape. This provides some compliance in the mooring line, and keeps line from chafing on the bottom. It also keeps the line from disturbing the bottom, as well as keeping it vertical underneath the buoy. In the case of the Cordell Bank buoy, the line that we are using is close to neutrally buoyant, and is very strong (Samson Amsteel, 12-strand polyethylene line), and was the desirable choice for its purpose. The top half of the line does appear to sink, and the bottom half is supported by small subsurface floats, achieving very similar results to those mentioned above. The floats are attached with longline clips, and will be easy to remove and reattach when the whole mooring needs to be recovered and redeployed. Hardware includes a galvanized steel swivel, to prevent twisting in the mooring line, and to thus relieve stress on mooring components. The instruments are attached using a meter long steel plate, deployed inline with chain in the top 2.5m of the water column. The ECO optics are kept at a distance of at least 4 inches from the face of the plate (or other surface), otherwise there will be a reflection seen in the turbidity data.

General Maintenance & Quality Assurance
-Make note of UDAS values and perform CTD profile when on site for comparisons to buoy data

-*Seabird 37 Microcat* is swapped every 6 weeks with a clean and checked sensor. All instruments should be calibrated annually and maintained according to manufacturer's specifications which can be found on the website or in any manual:
Manual:
http://www.seabird.com/pdf_documents/manuals/37SM_rs232_033.pdf
More on the care of conductivity cells:
http://www.seabird.com/pdf_documents/ApplicationNotes/appnote2DOct10.pdf

-*Wetlabs EcoFLNTUSB* is swapped every 6 weeks with a clean and checked sensor. All instruments should be calibrated annually and maintained according to manufacturer's specifications which can be found on the website or in any manual:
Manual:
http://www.wetlabs.com/products/pub/eco/flntuab.pdf
Additional Tech notes:
http://www.wetlabs.com/technicalnotes/technoteindex.htm

(I have also been told that a dilute vinegar solution, followed by DI water, may be used on the optics, especially before attempting any kind of calibration: even if the window looks clean, it may not be)

-*GPS* should be tested before use, and batteries should be monitored and changed when necessary. Battery level can be observed on the web page assigned to BML, and is monitored by the BML "booncheck" data monitoring system.

-*Buoy* surface hardware should be checked every trip for corrosion or other defects. Anchor should be pulled up every 6 mos, and checked for damage or corrosion. All hardware should be replaced as needed. Annually: mooring should be swapped for new mooring with all new hardware, regardless of appearance. Buoy should be repainted, zincs replaced (very small nodules welded to centerline of buoy hull).

Note: Be sure to note recovery/deployment details (i.e. date, time, position, missing/damaged instruments, damaged hardware, etc) in the logs on the network.

Post-Recovery from Field
Clean the instruments. Rinse 37 conductivity cell and ECO optics with freshwater as soon as possible. Then follow cleaning instructions in SBE and Wetlabs manuals (in Ocean Lab, or online at www.seabird.com and www.wetlabs.com). It helps to remove large debris and clean outside of instruments on deck before leaving, using the seawater washdown pump on the MP. Just be sure to rinse cell and optics with FW when finished. Remove jumper plug from ECO, and replace with dummy plug to shut it down.

Download Instruments
1.Connect SBE-37 to a PC. Open Seaterm, and follow download instructions in SBE-37 manual. In short, click on "connect", type in "stop" at the S prompt, and then click "upload". Save file to Seastsar/Ocean Group/Data/Cordell Bank/YYYYMMDD. File name follows the convention CBYYYYMMDDCT.asc. You then need to convert the .asc file to a .cnv file using SBE Data Processing. Once this is done, derive salinity and density using the same program.

2. Connect ECO to computer, and open Ecoview software. Set up comm port and open device file (see Wetlabs ECO manual for more details). Add power via a 9V battery to the comm. cable. As soon as power is applied, you will hear the shutter start to open, click on "stop data" until you can see that the sensor is connected (look up at date and time in upper left-hand corner). Go to the "data transfer" tab and click on receive data. Save data to Seastar\Ocean Group\Data\Cordell Bank\YYYYMMDD\fluor. File name follows the convention CBYYYYMMDDFX.raw.

Prepare Instruments for Deployment
First be sure that there are fresh batteries for both instruments. Install them.

CT: The SBE 37 sample interval is 1 min, with # samples to average = 1. Do not record salinity with each sample, in order to conserve battery—you can derive salinity when you download the data later. Do store time, reset it to UTC using the NIST clock online, and clear the memory. Once this is done, click on "capture", name the file and save it to Seastar\Ocean Group\Data\Cordell Bank\YYYYMMDD. Type in "DS" (for display status) at the S prompt, enter start date and time (see below for format), and then type "start later". Instrument will then start at the appointed time. Alternatively, you can skip the start date and time, and just type "start now".

Example:
SBE37-SM V 2.6b SERIAL NO. 4928   28 Jul 2008 14:49:10
not logging: received stop command
sample interval = 60 seconds
samplenumber = 0, free = 233016
do not transmit real-time data
do not output salinity with each sample
do not output sound velocity with each sample
store time with each sample
number of samples to average = 1
reference pressure = 0.0 db
serial sync mode disabled
wait time after serial sync sampling = 30 seconds
internal pump not installed
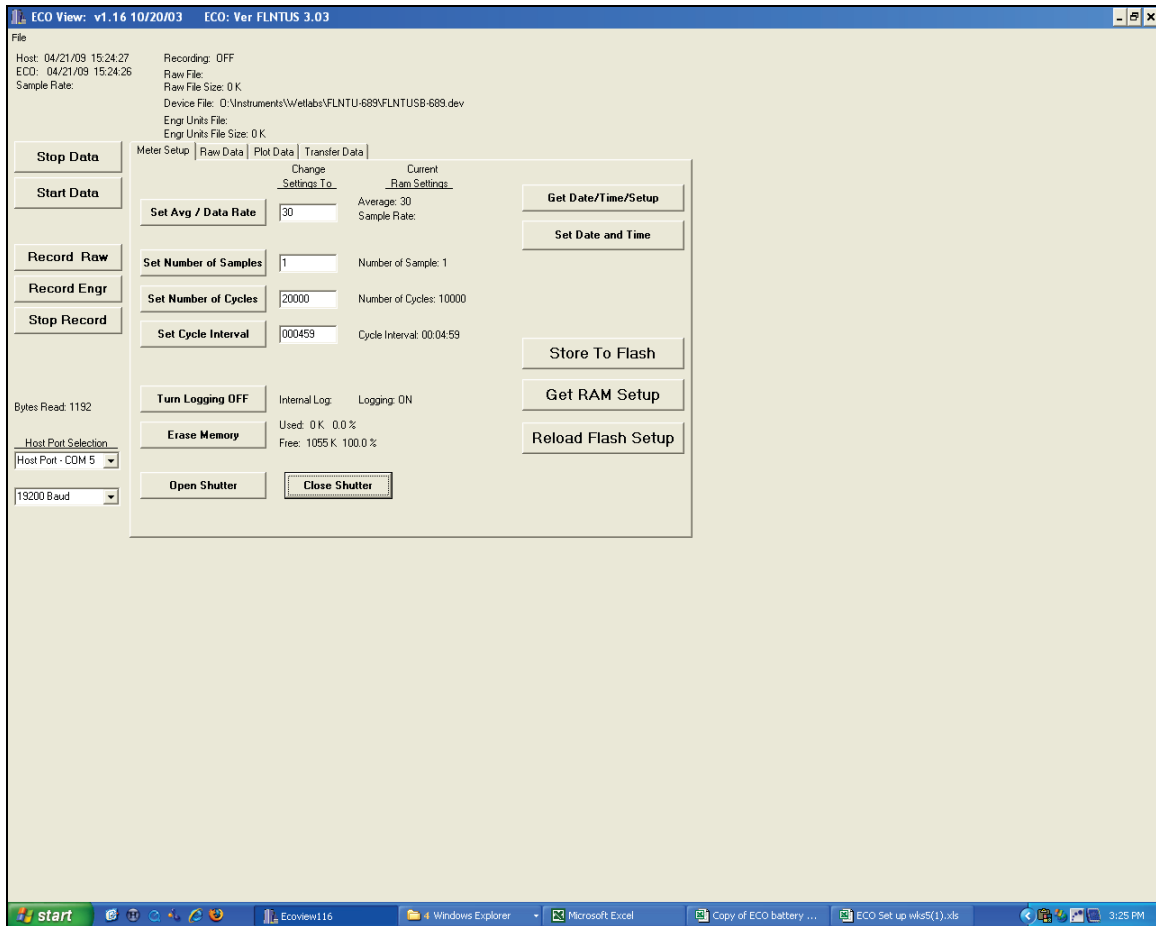temperature = 14.34 deg C
S>startddmmyy=280708
S>starthhmmss=170000
start time = 28 Jul 2008 17:00:00
S>startlater

FX: Add power and click multiple times on the "stop data" button to connect. The Wetlabs FLNTU sample interval is 4:59:59 mins, with # samples = 1. Number of cycles should be set to a number that ensures that the sensor will not stop sampling before it's supposed to (# cycles refers to the number of times, total, that the sensor will sample). Sample rate for the dual-channel sensors (fluor & turb) should be set to 30. Reset the clock to UTC using the NIST clock online, and clear the memory. Once this is all done, take a screen capture, save it to a word file, name the file, and save it to Seastar\Ocean Group\Data\Cordell Bank\YYYYMMDD. All changes need to be stored to flash by using the "set" buttons. To verify this, click on "get RAM setup", and you will see what is stored on the FLNTU. Once you know that the meter is set up correctly, remove power (if added externally) and wait until the sensor is ready to be deployed. Then, wait until the top of the minute, and plug in the jumper plug (that is provided with each instrument and marked) to start the sensor.

Example:

Note new deployment times, filenames and serial #'s in the Instrument Roster and Maintenance Logs and the CBBuoyMaintenanceLog.

Instruments are ready to go. Keep all loggers from the same mooring together with cable ties.

Data Processing
Run data through Cordell Bank matlab scripts. The scripts will:

-Check data interval, looking for any major gaps in the data
-Verify that times are in UTC
-Allow user to graphically check for any missing, suspicious, or obviously bad data, and flag accordingly. Data for each column of the data file are flagged with a single alpha-numeric code such that the first digit holds the first data column flag, the second digit holds the second data column flag, etc. Possible flags are 0-9, A-Z, a-z; however flag definitions are currently as follows: 0 - No known bad data; 1 - Known bad data: instrument malfunction/failure, loss of memory, loss of power, bio-fouling, electronic malfunction; 2 - Suspicious data (looks bad, but no known cause); 9 - Missing data (data column has a missing value code as defined in the metadata)

-Output data in an ascii file with format:

```
date time yearday temp_c cond_s/m sal_psu sigma-t flag
2008-04-23 20:09:01Z 0113.8396060 10.2245 3.64857 33.1561 25.4745 0000000
2008-04-23 20:10:02Z 0113.8403010 10.2243 3.64863 33.1569 25.4752 0000000
2008-04-23 20:11:01Z 0113.8409950 10.2245 3.64859 33.1563 25.4747 0000000
2008-04-23 20:12:02Z 0113.8416900 10.2253 3.64882 33.1579 25.4758 0000000
```

Data is then associated with appropriate metadata, converted to NetCDF and automatically transferred via OPeNDAP to the NODC. Data can be accessed directly via NODC and the BOON data query page.