Data Synopsis for HLY0801

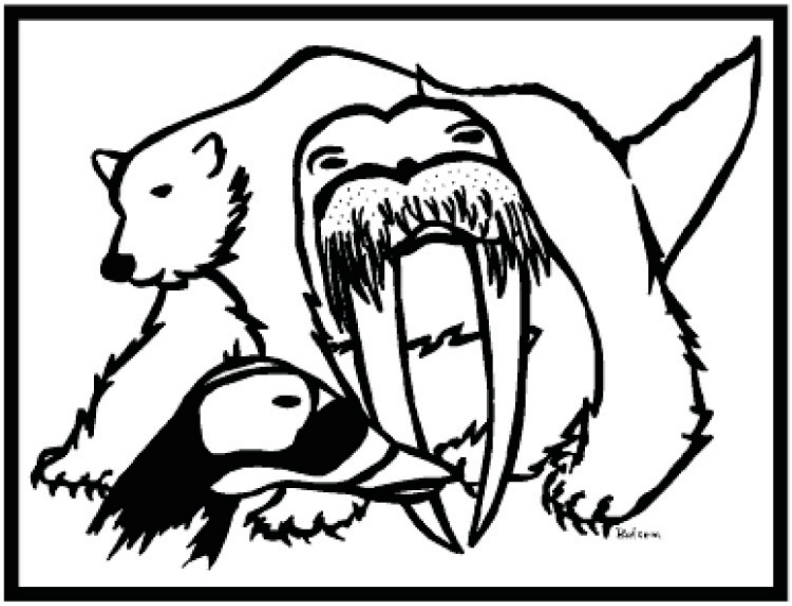
March 14 – March 25, 2008

Dutch Harbor to Dutch Harbor

Chief Scientist - Lee Cooper

Healy Captain – Tedrick R. Lindstrom

ST LAWRENCE ISLAND POLYNYA PROJECT



Prepared by:

Tom Bolmer, David Forcucci,
David Hassilev, & Steve Roberts

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Project Summary

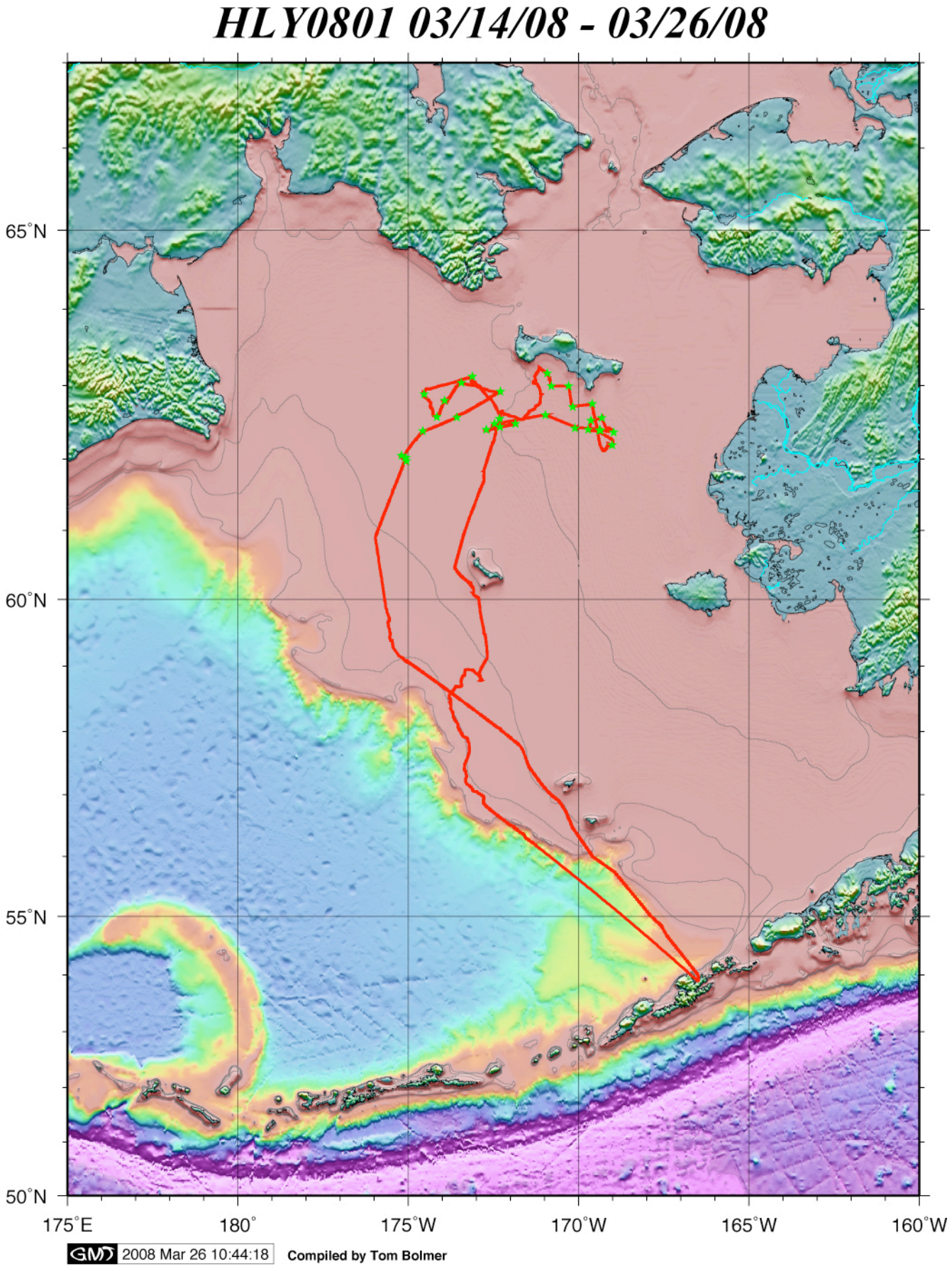
BEST Benthic Ecosystem Response to Changing Ice Cover in the Bering Sea

(National Science Foundation ARC-0802290)

The Healy 08-01 cruise is focused on patch dynamics of walruses and their food supplies on the shallow northern Bering Sea shelf. Patch dynamics is a conceptual approach to ecosystem and habitat analysis that emphasizes the dynamics of heterogeneity within a system. Benthic-oriented measurements have been taken in the northern Bering Sea for many years because the region is known to support highly productive benthic communities and food resources for benthic-feeding apex predators, including gray whales, bearded seals, walruses, and diving sea-ducks—all of which are important for subsistence hunting by local Bering Sea communities. Continued benthic sampling is planned in the St. Lawrence Island area to complement the planned field studies of walrus distributions. Recent studies (e.g. Grebmeier *et al.* (2006; Science 10 March 2006: Vol. 311. no. 5766, pp. 1461 - 1464) suggested that climate warming may change the present benthic-dominated northern Bering Sea ecosystem to one more pelagic in nature, similar to the southern Bering Sea—a direct result of changing trophic interactions. Specific evaluation of dominant infaunal prey of walrus (e.g., bivalves, gastropods, and polychaetes), will be undertaken during the benthic field component of this BSIERP-BEST walrus-prey patch dynamics study. These studies will be analyzed in the context of retrospective benthic data sets collected over the last 20 years in the region. Important considerations will be spatial heterogeneity of benthic infaunal populations and sediment tracers in oceanographic context at coarse scales (20 nm) to evaluate overall effects on ecological processes. Scaling strategies will be used from the small scale (3-5 nm) used for walrus-prey patch dynamics study to larger (10-20 nm) and even regional (50-100 nm) scales in order to evaluate information from the local ecosystem to overall northern Bering Sea regional scale in which the walrus reside.

Standard water column measurements are also being made, including salinity, temperature, water column optical characteristics, nutrients, chlorophyll, zooplankton distributions and sea ice biological features in addition to benthic sampling and walrus distribution studies. Marine mammal and seabird observations are also being made from the ship’s bridge.

Cruise Track



Personnel

Science Party Personnel

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Ship's Crew

HEALY Sailing List for March 13, 2008.

Lindstrom, Tedric CAPT
Bateman, Dale CDR
Hammond, Mark LCDR
Stewart, Jeffrey LCDR
Angelo, James YNC
Arakaki, Rebecca SK2
Ayers, Silas LT
Bartlett, Charles MST1
Beasley, Corey HSCS
Beckmann, Rachel LTJG
Bender, Zachary ENS
Berringer, Mike ETC
Blas, Paul FN
Brogan, John MKC
Buford, Aimee BM2
Carr, Michael LTJG
Carter, John FS2
Cole, Tyler SN
Conroy, William BM3
Coombe, Jeffrey MK2
Dabe, Jeffrey IT2
Daem, Steven ET2
Davidson, Ash BM1
Davis, Jonathon ET2
Dull, Steven FS2
Dunning, Lara BM3
Elliott, Stephen LTJG
Fernandez, Chelsey SN
Finley, Nathan EM2
Ford, Angela SN
Galvez, Oscar R. LT
Glenzer, William BM1
Gonzalez, Fernando MK2
Ghosn, Kathleen FN
Hamilton, H. Mark FS3
Harbinsky, Mark ET2
Harris, Daniel SK1
Hurtado, Daniell EM1
Jacobs, Bryson ENS
Johnston, Garrett SN
Jones, Greg MKCS
Kidd, Wayne BMC
Kruger, Thomas MST3
Laisure, Jeremy SK2
Lambert, Douglas MK1
Layman, Rich MST1
Liebrecht, Brian ET1
Loftis, Jon MK1
Lyons, Sean R CWO3
Manangan, Sorjen OSC
Mandrie, Montarno DC3
Marsden, George DCC
Mastrota, Leigh FN
McNally, Terence SK1
McManus, Gene SN
Meadowcroft, Brian LTJG
Merten, James SN
Miller, Valerie CWO2
Murphy, Nicholas MK2
Meyer, Heather MK2
Newton, Elizabeth LTJG
Passalacqua, Joseph ETCM
Pentecost, James DC1
Podhora, Curtis EMCM
Quichocho, Robert MK1
Redd, Davion DC2
Rieg, Mark MSTC
Rivera-Maldonado, Abner SKC
Rocklage, Eric MST1
Rudibaugh, Kenneth MK1
Shaffer, Hans EM1
Siciak, Anthony MK3
Smith, Corey MK3
Smith, Josh LTJG
Sullivan, Timothy BMCS
Swanson, Shawn ET1
Thomas, Tasha ENS
Thompson, Emily SN
Tomlin, Mathew SN
Travers, Cynthia LTJG
Von Kauffmann, Daniel IT1
Wagner, Alexander FN
Ward, John CWO3
Whiting, Allan, MK2
Williams, Tony FSCS
Worrell, Kenneth EM1
Wright, Tiffany MST2
Yeckley, Andy BM3
Zitting, Arrene F

Science Components and their major sampling activities

Component, PIs	Sampling activities
Grebmeier & Cooper	BEST Benthic Ecosystem Response to Changing Ice Cover in the Bering Sea
Trites & Jay	BSIERP: Patch Dynamics
Gradinger, Bluhm, & Iken	BEST: Sea Ice Algae, a Major Food Source for Herbivorous Plankton and Benthos in the Eastern Bering Sea. Determine the biomass, diversity, production and fate of ice algae in the BEST study area.
Grebmeier & Cooper	BSIERP Project: Epi-benthic survey
Frey	Impacts of Sea Ice Variability and Polynya Formation on Biological Productivity in the Northern Bering Sea
Lovvorn, Grebmeier, & Cooper	Climate-driven changes in impacts of benthic predators in the northern Bering Sea
Kuletz & Irons	North Pacific Pelagic Seabird Observer Program
Zhao	Optics under sea ice and heat absorption impacted by bioprocess
Moore	National Marine Mammal Laboratory shipboard marine mammal observation program
Litwin & Hott	*Thin Ice: An Exploration of the Bering Sea at the Dawn of Global Warming.* A public education legacy project developed for the International Polar Year-2007-2008
Sheffield	Investigate ice seal stock structure, migration routes, and dispersal patterns of ice seals that occur in the Northern Bering Sea as well as assist in the NMML effort.

Distribution Contents

Introduction to Data

The Healy data acquisition systems continuously log data from the instruments used during the cruise. This document describes:

- The structure and organization of the data on the distribution media.
- The format and contents of the data strings.
- Formulas for calculating values.
- Information about the specific instruments in use during the cruise.
- A log of acquisition problems and events during the cruise that may affect the data.
- Scanned calibration sheets for the instruments in use during the cruise.

The data is distributed on a small USB disk drive.

***IMPORTANT**: Read the section, "Acquisition Problems and Events," for important information that may affect the processing of this data.*

There are two logging system on the Healy. The ship (ESU) runs the SCS logging system and the LDEO support group runs the LDS logging system. This provides some redundancy in logging. The main purpose of LDS is to support the sonars and the output is saved in Raw.

The Scientific Computer System (SCS) is a data acquisition, and display system designed for Oceanographic, Atmospheric, and Fisheries research applications. It acquires sensor data from shipboard oceanographic, atmospheric, and fisheries sensors and provides this information to scientists in real time via text and graphic displays, while simultaneously logging the data to disk for later analysis. SCS also performs quality checks by monitoring I/O, providing delta/range checks and plotting data after acquisition.

The LDEO Data System is somewhat distant relative of the logging code that has grown through more than a decade of use at LDEO. It is a significant revision of the current (2004) code used on the R/V Ewing (the Ewing Data System) and is architecturally much different. Because of this, LDS is still growing and at the moment (2008) this is the only operational implementation.

Data

Data are received via RS-232 serial connections. In SCS a time tag is added at the beginning of each line of data in the form,

mm/dd/yyyy,hh:mm:ss.sss,[data stream from instrument] where:

Format	Value used
mm	2 digit month of the year
dd	2 digit ay of the year
yyyy	4 digit year
hh	2 digit hour of the day
mm	2 digit minute
ss.sss	seconds

An example string from the Seabeam Centerbeam file is:

04/13/2007,06:49:20.920,$SBCTR,2007,4,13,06:49:09.437,57.158792,-165.664322 ,69.15,60*00

All times are reported in UTC. Each file type has it's own NEMA string name ($SBCTR as an example).

The delimiters that separate fields in the raw data files are commas. Care should be taken when reprocessing the data that the field's separations are clearly understood.

Directories:

1_Minute_Averaged_Data: This directory contains all of the under way data averaged over a 1 minute window in time.

SCS_Data*:* This directory contains serial data collected by the SCS version 3.3b data collection system in different directories. Directory names are labeled by the instrument name and string type of the data collected. A description of the data contained in this directory is below.

LDS_Data*:* This directory contains serial data collected by the Lamont LDS data collection system in different directories. Directory names are labeled by the instrument name and string type of the data collected. A description of the data contained in this directory is below.

Raw: This directory contains raw data as recorded by individual instruments and put into different directories. Directory names are labeled by the instrument name and string type of the data collected. A description of the data contained in this directory is below.

Meta_data: This directory contains documents useful in the post analysis of the data on this DVD media set. The data type are separated into different directories by type. A description of these directories is below.

1_Minute_Averaged_Data:

HLY0801_distance.csv.gz - Distance along track from port.

HLY0801_Averaged.csv.gz - All the Under way data averaged for 1 minute.

Shapefile - All of the 1 minute under way data averaged at 1 minute spacing in an ESRI GIS Shapefile.

SCS_Data:

/aft_a_frame - Wire tension, wire out, and wire speed for the Aft A frame sheaves.

/air_temp_f - Temperature data from the RM Young wind sensor in Fahrenheit. Data is derived from data from files in the rmyoung_air directory

/ashtech_attitude - Attitude in NMEA format from the Ashtech ADU5 GPS receiver

/ashtech_gga - Position data in NMEA GGA format from the Ashtech ADU5 GPS receiver

/ashtech_gll - Position data in NMEA GLL format from the Ashtech ADU5 GPS receiver

/ashtech_hdt - Heading data in NMEA HDT format from the Ashtech ADU5 GPS receiver

/dew_point_f - Dew point temperature derived from air temp

/flomet_a – Flow meter data just upstream of the A TSG and Fluorometer.

/flomet_b – Flow meter data just upstream of the B TSG and Fluorometer.

/fluro_a – Flurometer for A TSG sensor.

/fluro_b - Flurometer for B TSG sensor.

/glonass_gga - Position data in NMEA GGA format from the GLONASS GPS receiver.

/glonass_gll - Position data in NMEA GLL format from the GLONASS GPS receiver.

/gyro_mk27 - Heading data in NMEA HDT format from the Sperry MK27gyro compass

/gyro_mk39 - Heading data in NMEA HDT format from the Sperry MK39 gyro compass

/ibs_waypoints - Waypoints from the Healy's Integrated Bridge System

/isus -

/knudsen - Depth data in a proprietary PKEL format received from Knudsen 320 B/R serial output

/met3a_sen – Meterology data from the top of the Jackstaff.

/oxygen_a – Oxygen values from A TSG.

/oxygen_b - Oxygen values from A TSG.

/pcode_aft_gga - Position data in NMEA GGA format from the Trimble Centurion receiver located in the Computer lab

/pcode_aft_gll - Position data in NMEA GLL format from the Trimble Centurion receiver located in the Computer lab

/pcode_aft_vtg - Course and speed over ground in NMEA VTG format from the Trimble Centurion receiver located in the Computer lab

/pcode_aft_zda - Time and date data in the NMEA ZDA format. Data retrieved from the Trimble Centurion receiver located in the Computer lab

/pcode_bridge_gga - Position data in NMEA GGA format from the Trimble GPS receiver located on the bridge.

/pcode_bridge_gll - Position data in NMEA GLL format from the Trimble GPS receiver located on the bridge.

/pcode_bridge_vtg - Course and speed over ground data in NMEA VTG format from the Trimble GPS receiver located on the bridge.

/posmv_gga - Position data in NMEA GGA format from the POS/MV

/posmv_gst - Pseudorange error statistics in NMEA GST format from the POS/MV

/posmv_hdt - Heading data in NMEA HDT format from the POS/MV

/posmv_pashr - Roll, pitch and heave from POS MV inertial navigation system.

/posmv_vtg - Course and speed over ground in NMEA VTG format from the POS/MV

/posmv_zda - Time and date data in NMEA ZDA format from the POS/MV

/rmyoung_air - Temperature, humidity, air pressure data in NMEA XDR format from the RM Young meteorological system

/rmyportwind - Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the port side of the Healy.

/rmystbdwind - Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the starboard side of the Healy.

/samos_data – Meterology data for SAMOS.

/sbd_a_frame - Wire tension, wire out, and wire speed for the starboard A frame sheaves.

/seabeam_center - Center depth data from the Seabeam 2112

/solar_radiometers – Solar Radiometer data for SW and IW.

/sperry_speedlog - ground/water speed data from the Sperry Speed Log

/surface_par- Photosynthetic Active Radiation volts and Microeinstens/m2 se from the surface par sensor

/sv2000 - Sound Velocity data from the SV2000 sound velocimeter located in the ADCP BB150 sonar well

/true_wind_port - True wind speed data derived from gyro data and rmyportwind

/true_wind_stbd - True wind speed data derived from gyro data and rmystbdwind

/tsg_a -Thermosalinograph and fluorometer data from the A TSG instruments in the Bio/Chem Lab.

/tsg_b -Thermosalinograph and fluorometer data from the B TSG the instruments in the Bio/Chem Lab.

/winch_data - Line out and speed data from the winch system.

/wind_sen_a – Wind data from the Jack Staff.

/wind_sen_b – Wind data from the Yard.

Extra files in the directory SCS_Data*:*

ACQLOG.LOG - Contains the data as to what occurred with SCS data. It shows when data collection was started and stopped.

Incidents_YYYYMMDD-TTTTTT.DTM - Contains any incident data which were triggered in SCS 3.3b.

sensor_YYYYMMDD-TTTTTT.scf - Contains the configuration file for data collection as configured by SCS 3.3b.

LDS_Data:

/AloftConCam - Contains picture files separated by folders named by YearJulian (YYYYJJJ). The picture files are in 5 minute JPEG format.

/FantailCam - Contains picture files separated by folders named by YearJulian (YYYYJJJ).). The picture files are in 5 minute JPEG format.

/adu5 - Contains the data from the ADU5 GPS.

/aggps - Contains the data from the AG GPS.

/bgm221 - Contains the data from the BGM221 Gravimeter.

/bgm222 - Contains the data from the BGM222 Gravimeter.

/events - Contains the logs of event for different systems.

/mk27 - Contains the data from the MK27 Gravimeter.

/mk30 - Contains the data from the MK30 Gravimeter.

/posatt - Contains the attitude data from the POSMV GPS.

/posnav - Contains the navigation data from the POSMV GPS.

/posreform2sb - Contains the navigation data from the POSMV GPS reformatted for the SeaBeam.

/sbctr - Contains the center beam data from the SeaBeam.

/sbsv - Contains the surface sound velocity data for the SeaBeam.

/seabeam - Contains the data from the SeaBeam.

/tsg_met - Contains the all data from SIO TSG and Met sensors.

Meta_Data:

/elog - Contains the technician's narrative of important events, which occurred both to the network and to individual sensors.

/Systems_Calibration_Data - Contains calibration for various instruments.

/Bridge_Logs

DDMMMYY.doc - The "smooth log" containing events recorded by the bridge watch.

DDMMMYYWX.xls - Weather log recorded by the watch.

DDMMMYYNAV.xls - Navigation logs recorded by the watch.

Raw:

/adcp75 - 75 KHz ADCP data

/adcp150 - 150 Khz ADCP data

/ctd - CTD data in directories by Cast number.

/knudsenraw - Knudsen 320B/R data

/pos_mv - POS/MV and other navigation data

/xbt - Expendable Bathythermograph data.

Images:

/Satellite_Image - Contains satellite imagery in jpeg format

/dmsp - dmsp folders labeled by Year, Month, Day

/hrpt - hrpt folders labeled by Year, Month, Day

ice_observations*:*

Directories of the Ice Observations taken for each day March 14 to March 25.

Contents by directory:

SCS_Data:
aft_a_frame
air_temp_f
ashtech_attitude
ashtech_gga
ashtech_gll
ashtech_hdt
dew_point_f
flomet_a
flomet_b
fluro_a
fluro_b
glonass_gga
glonass_gll
gyro_mk27
gyro_mk39
ibs_waypoints
isus
knudsen
met3a_sen
oxygen_a
oxygen_b
pcode_aft_gga
pcode_aft_gll
pcode_aft_vtg
pcode_aft_zda
pcode_bridge_gga
pcode_bridge_gll
pcode_bridge_vtg
posmv_gga
posmv_gst
posmv_hdt
posmv_pashr
posmv_vtg
posmv_zda
rmyoung_air
rmyportwind
rmystbdwind
samos_data
seabeam_center
solar_radiometers
sperry_speedlog
stbd_a_frame
surface_par
surface_temp
sv2000
true_wind_port
true_wind_stbd
tsg_a
tsg_b
wind_sen_a
wind_sen_b
Raw:
adcp150
adcp75
ctd
knudsenraw
xbt
Images:
Satellite_Images
Satellite_Images/dmsp
Satellite_Images/hrpt
LDS_Data:
AloftConnCam
FantailCam
adu5
aggps
bgm221
bgm222
events
mk27
mk30
posatt
posnav
posreform2sb
sbctr
sbsv
seabeam
tsg_met
Meta_Data:
Bridge_Logs
Systems_Calibration_Data
elog

Merged Data

LDEO Averaged One Minute Data File

The data are summarized into an averaged one (1) minute data file by the LDEO technician. This file takes the average value centered around the minute, (30 seconds either side of the whole minute). The data are the raw values as they are logged. There has been no quality control done on these files. Those wishing more accurate and quality controlled values should process the data in the directories described below in the document.

From the start of HLY0801 until 3/22/8 at 20:11 UTC the "TRUE" winds for the Ultrasonic winds were calculated improperly. You will need to recalculate those. The words in Fields 34, 35, 36, and 39 are wrong until this date. In Fields 54 and 55 are the True winds calculated using the Starboard Ship's RM Young wind bird.

HLY0801_track.csv

6944,2008/03/18 16:08,62.7178957,-174.0047168,213.6,10.1,216.3,71.5,-1.731,-1.275,26.5602,33.093,0.699,0.070,0.000,0.014,1.704,0.170,0.589,0.059,2.93,3.30,0.16,278.38,257.36,257.33,3.31,-15.87,94.39,1017.99,0.00,276.49,1.76,1.86,5.20,225.43,1.87,8.82,4.44,7.841,-1.275,0.000,,0.000,0.000,2,-276,-7,0,1,-182,-1,0,99,99

6945,2008/03/18 16:09,62.7155853,-174.0082005,204.9,10.3,204.6,71.0,-1.731,-1.276,26.5577,33.091,0.625,0.062,0.000,0.014,1.650,0.165,0.570,0.057,3.00,3.40,0.64,277.30,257.39,257.45,3.31,-15.88,94.30,1018.03,0.00,284.64,2.73,2.19,4.86,235.55,2.71,2.45,3.64,7.842,-1.276,0.000,,0.000,0.000,2,-275,-7,0,1,-183,-1,0,99,99

6946,2008/03/18 16:10,62.7128363,-174.0101985,196.9,10.6,197.2,67.1,-1.726,-1.278,26.5468,33.078,0.624,0.062,0.000,0.014,1.632,0.163,0.555,0.055,2.94,3.30,1.20,278.48,257.45,257.44,3.31,-15.89,94.21,1018.02,0.00,274.01,2.81,349.11,5.50,245.37,3.28,343.65,3.96,7.812,-1.278,0.000,,0.000,0.000,2,-274,-7,0,1,-185,-1,0,99,99

Field	*DATA*	*Example*	*UNITS*
01	ID	6944	sample count
02	date	2008/03/18 16:08	date & time UTC (year/month/day hour:minute)
03	lat	62.7178957	POSMV Latitude (decimal degrees)
04	lon	-174.0047168	POSMV Longitude (decimal degrees)
05	cog	213.6	POSMV Course Over Ground (angular distance from 0 (North) clockwise through 360, 1 minute average)
06	sog	10.1	POSMV Speed Over Ground (Knots, 1 minute average
07	heading	216.3	POSMV ship heading(angular distance from 0 (North) clockwise through 360, 1 minute average)
08	depth	71.5	Seabeam centerbeam depth(meters, 1 minute average)
09	SST	-1.731	SBE3s RemoteTemperature, Sea Chest intake (Celsius, 1 minute average)
10	TSG_InTemp	-1.275	SBE45 internal temperature (Celsius, 1 minute average)
11	TSG_Cond	26.5602	SBE45 Water Conductivity (millisiemens/centimeter, 1 minute average)
12	TSG_Sal	33.093	SBE45 Water Salinity (PSU, 1 minute average)
13	SCF-FL	0.699	SCF Fluorometer (Ug/l, 1 minute average)
14	SCF-FL-V	0.070	SCF Fluorometer (Volts, 1 minute average)
15	SCF-Turb	0.000	SCF Turbidity (NTU, 1 minute average)
16	SCF-Turb-V	0.014	SCF Turbidity (Volts, 1 minute average)
17	SCUFA-FL	1.704	SCUFA Fluorometer (Ug/l, 1 minute average)
18	SCUFA-FL-V	0.170	SCUFA Fluorometer (Volts, 1 minute average)
19	SCUFA-Turb	0.589	SCUFA Turbidity (NTU, 1 minute average)
20	SCUFA-Turb-V	0.059	SCUFA Turbidity (Volts, 1 minute average)
21	tsg_flow_A	2.93	Flowmeter in-line with PSTSGA, PSOXA, PSFLA (LitersPerMinute, 1 minute average)
22	tsg_flow_B	3.30	Flowmeter in-line with PSFLB (LitersPerMinute, 1 minute average)
23	SWR	0.16	Short Wave Radiation (W/M^2, 1 minute average)
24	LWR	278.38	Long Wave Radiation (W/M^2, 1 minute average)
25	LWR_Dome_T	257.36	LWD Dome Temperature (Deg K, 1 minute average)
26	LWR_Body_T	257.33	LWD Body Temperature (Deg K, 1 minute average)
27	PAR	3.31	Surface PAR (uE/Sec/M^2, 1 minute average)
28	MET3A_Temp	-15.87	MET3A Air Temperature (Deg C, 1 minute average)
29	MET3A_RH	94.39	MET3A Relative Humidity (%, 1 minute average)
30	MET3A_Baro	1017.99	MET3A Barometric Pressure (millibars, 1 minute average)
31	MET3A_Precip	0.00	MET3A Precipitation (mm, 1 minute average)
32	JS_WndDirR	276.49	Jackstaff Relative wind direction (deg, 1 minute average)
33	JS_WndSpdR	1.76	Jackstaff Relative wind speed (m/s, 1 minute average)
34	JS_WndDirT	1.86	Jackstaff True wind direction (deg, 1 minute average)
35	JS_WndSpdT	5.20	Jackstaff True wind speed (m/s, 1 minute average)
36	MM_WndDirR	225.43	Main Mast Relative wind direction (deg, 1 minute average)
37	MM_WndSpdR	1.87	Main Mast Relative wind speed (m/s, 1 minute average)
38	MM_WndDirT	8.82	Main Mast True wind direction (deg, 1 minute average)

Field	*DATA*	*Example*	*UNITS*
39	MM_WndSpdT	4.44	Main Mast True wind speed (m/s, 1 minute average)
40	SBE_Oxy	7.841	SBE-43 Oxygen(ml/l, 1 minute average)
41	SBE_Oxy_T	-1.275	SBE-43 Oxygen Temperature(Deg C, 1 minute average)
42	Optode_Oxy	0.000	Optode Oxygen(ml/l, 1 minute average)
43	Optode_Oxy_T		Optode Oxygen Temperature(Deg C, 1 minute average)
44	Isus_1	0.000	Isus Aux 1(Volts, 1 minute average)
45	Isus_2	0.000	Isus Aux 2(Volts, 1 minute average)
46	WinchAft	2	Aft A-Frame Winch number
47	TensionAft	-276	Aft A-Frame Winch Wire tension(Pounds, 1 minute average)
48	WireOutAft	-7	Aft A-Frame Winch Wire out (Meters, 1 minute average)
49	SpeedAft	0	Aft A-Frame Winch Wire speed(Meters/minute, 1 minute average)
50	WinchSbd	1	Starboard A-Frame Winch number
51	TensionSbd	-182	Starboard A-Frame Winch Wire tension(Pounds, 1 minute average)
52	WireOutSbd	-1	Starboard A-Frame Winch Wire out (Meters, 1 minute average)
53	SpeedSbd	0	Starboard A-Frame Winch Wire speed(Meters/minute, 1 minute average)
54	StbdWndSpdT	99	RMYoung Wind Speed, starboard(Knots, 1 minute average)
55	StbdWndDirT	99	RMYoung Wind Direction, starboard(angular distance from 0 (North) clockwise through 360, 1 minute average)

File Formats of Data Collected Underweigh

In the sections below for each data type the directory name is listed, then an example file name, and then 3 lines from that file. This part is followed by a table that lists the data contained in the string.

./SCS_Data

The following data types are to be found in the SCS_Data directory.

Underway Data

Meteorology Data

R. M. Young Sensors

R.M. Young Air Temperatures

Temperature, humidity, air pressure data in NMEA XDR format from the RM Young meteorological system.

./rmyoung_air

RMYoung-Air_20070414-182437.Raw

04/14/2007,18:24:40.693,$WIXDR,C, -6.62,C,1,H, 89,P,1,C, -8.06,C,1,P, 994.24,B,2,D,-35,M,3hh

04/14/2007,18:24:46.677,$WIXDR,C, -6.49,C,1,H, 89,P,1,C, -7.93,C,1,P, 994.32,B,2,D,-35,M,3hh

04/14/2007,18:24:49.678,$WIXDR,C, -6.49,C,1,H, 89,P,1,C, -7.93,C,1,P, 994.24,B,2,D,-35,M,3hh

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:49.678	hh:mm:ss.sss
3	NMEA header	$WIXDR	ASCI text
4	Data type for field 5	C	Temperature
5	Air Temperature	-6.62	Celsius
6		C	
7		1	
8	Data Type for field 9	H	ASCII character
9	Relative Humidity	89	Percent
10		P	
11		1	
12	Data type for field 13	C	
13	Dew Point Temperature	-8.06	Celsius
14		C	
15		1	
16	Data type for field 17	P	Pressure
17	Barometer	994.24	hPa
18		B	
19		2	
20	Data type for field 20	D	
21	Elevation	-35	Meters
22		M	
23		3hh	

R.M. Young Air Temperatures, Fahrenheit (Derived)

Temperature data from the RM Young wind sensor in Fahrenheit. Data is derived from data from files in the rmyoung_air directory.

./air_temp_f

AirTemp-F_20070413-000000.Raw

04/13/2007,00:00:02.074,$DERIV,28.83,-1.76,

04/13/2007,00:00:05.074,$DERIV,28.62,-1.88,

04/13/2007,00:00:08.074,$DERIV,28.62,-1.88,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/13/2007	mm/dd/year
2	SCS logged Time GMT	00:00:02.074	hh:mm:ss.sss
3	NMEA header	$DERIV	ASCI text
4	Air Temperature	28.83	Fahrenheit
5	Air Temperature	-1.76	Celsius

R.M. Young Wind. Port

Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the port side of the Healy.

./rmyportwind

RMYPortWind_20070414-182437.Raw

04/14/2007,18:24:38.490,$WIMWV,033,R,028.1,N,A*36

04/14/2007,18:24:39.505,$WIMWV,041,R,028.7,N,A*35

04/14/2007,18:24:40.521,$WIMWV,034,R,029.4,N,A*35

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:38.490	hh:mm:ss.sss
3	NMEA header	$WIMWV	ASCII text
4	Wind Direction	033	Degrees
5	R= Relative	R	ASCII character
6	Wind Speed	028.1	Knots
7	N= Knots	N	ASCII character
8	A= Valid Data	A	ASCII character
9	Check sum	*36	ASCII text

R.M. Young Wind, Starboard

Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the starboard side of the Healy.

./rmstbwind

RMYStbdWind_20070414-182437.Raw

04/14/2007,18:24:38.677,$WIMWV,044,R,025.4,N,A*3E

04/14/2007,18:24:39.693,$WIMWV,045,R,025.6,N,A*3D

04/14/2007,18:24:40.724,$WIMWV,042,R,025.2,N,A*3E

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:38.677	hh:mm:ss.sss
3	NMEA header	$WIMWV	ASCII text
4	Wind Direction	044	Degrees
5	R= Relative	R	ASCII character
6	Wind Speed	025.4	Knots
7	N= Knots	N	ASCII character
8	A= Valid Data	A	ASCII character
9	Check sum	*3E	ASCII text

R.M. Young Wind True, Port (Derived)

True wind speed data derived from gyro data and rmyportwind.

./true_wind_port

PortWnd-T_20070415-000000.Raw

04/15/2007,00:00:03.927,$DERIV,18.59,4.57,30.6,12,12.5,343.7,344.2,

04/15/2007,00:00:05.927,$DERIV,19.69,10.28,31.4,16,12.5,344.2,344.2,

04/15/2007,00:00:07.927,$DERIV,19.85,3.73,31.8,12,12.4,344.1,344.2,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	,00:00:03.927	hh:mm:ss.sss
3	NMEA header	$DERIV	ASCII text
4	Wind Speed derived	18.59	knots
5	Wind Directions derived	4.57	degrees
6	Wind Speed relative	30.6	knots
7	Wind Direction relative	12	direction
8	Speed over ground (pos mv)	12.5	knots
9	Course over ground (pos mv)	343.7	Degrees
10	Heading (pos mv)	344.2	Degrees

R.M. Young Wind True, Starboard (Derived)

True wind speed data derived from gyro data and rmystbdwind.

./true_wind_stbd

StbdWnd-T_20070415-000000.Raw

04/15/2007,00:00:03.396,$DERIV,17.33,3.47,29.4,11,12.5,343.7,344.2,

04/15/2007,00:00:05.396,$DERIV,17.05,15.29,28.5,18,12.5,344.2,344.2,

04/15/2007,00:00:07.396,$DERIV,19.99,13.31,31.4,18,12.4,344.1,344.2,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.396	hh:mm:ss.sss
3	NMEA header	$DERIV	ASCI text
4	Wind Speed derived	19.99	knots
5	Wind Directions derived	13.31	degrees
6	Wind Speed relative	31.4	knots
7	Wind Direction relative	18	direction
8	Speed over ground (pos mv)	12.4	knots
9	Course over ground (pos mv)	344.1	Degrees
10	Heading (pos mv)	344.2	degrees

Dew Point (Derived)

Dew Point derived from rmyoung_air.

./dew_point_f

DewPt-F_20070414-182437.Raw

04/14/2007,18:24:41.099,$DERIV,17.49,-8.06,

04/14/2007,18:24:44.099,$DERIV,17.73,-7.93,

04/14/2007,18:24:47.099,$DERIV,17.73,-7.93,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:47.099	hh:mm:ss.sss
3	NMEA header	$DERIV	ASCII text
4	Air Temperature	17.73	Fahrenheit
5	Air Temperature	-7.93	Celsius

Jack Staff Meteorological Senors

Weather Sensors on top of the Jack Staff.

./met3a_sen

MET3A-Sen_20080312-000000.Raw

03/12/2008,21:02:17.810,$PSMEA,-6.29,83.89,1018.43,14.17*5C

03/12/2008,21:02:19.810,$PSMEA,-6.28,83.90,1018.45,14.18*5C

03/12/2008,21:02:21.810,$PSMEA,-6.28,83.90,1018.45,14.17*53

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/12/2008	mm/dd/year
2	SCS logged Time GMT	21:02:17.810	hh:mm:ss.sss
3	NMEA header	$PSMEA	ASCII text
4	Air Temperature	-6.29	Celsius
5	Relative Humidity	83.89	%
6	Barometric Pressure	1018.45	milibars
7	Precipitation, total accumulation	14.17	milimeters
8	Check sum	*5C	ASCII text

Jack Staff Wind Sensors

Ultrasonic Wind Sensors on top of the Jack Staff.

From the start of HLY0801 until 3/22/8 at 20:11 UTC the "TRUE" winds for the Ultrasonic winds were calculated improperly. You will need to recalculate those.

./wind_sen_a

WIND-SEN-A_20080312-000000.Raw

03/12/2008,21:18:00.841,$PSWDA,52.45,13.92,341.17,14.81*62

03/12/2008,21:18:02.856,$PSWDA,53.55,14.15,333.55,15.14*64

03/12/2008,21:18:04.841,$PSWDA,52.27,14.48,337.10,14.35*6F

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/12/2008	mm/dd/year
2	SCS logged Time GMT	21:18:00.841	hh:mm:ss.sss
3	NMEA header	$PSWDA	ASCII text
4	True Wind Direction	-52.45	degrees
5	Relative Wind Speed	13.92	m/s
6	Relative Wind Direction	341.17	degrees
7	True Wind Speed	14.81	m/s
8	Check sum	*62	ASCII text

Yard Arm Wind Senors

Ultrasonic Wind Sensors on top of the Jack Staff.

From the start of HLY0801 until 3/22/8 at 20:11 UTC the "TRUE" winds for the Ultrasonic winds were calculated improperly. You will need to recalculate those.

/wind_sen_b

WIND-SEN-B_20080312-000000.Raw

03/12/2008,21:49:48.919,$PSWDB,45.64,15.53,325.29,14.45*68

03/12/2008,21:49:50.919,$PSWDB,46.55,15.48,328.82,13.39*63

03/12/2008,21:49:52.919,$PSWDB,46.36,15.48,326.14,14.68*64

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/12/2008	mm/dd/year
2	SCS logged Time GMT	21:49:48.919	hh:mm:ss.sss
3	NMEA header	$PSWDB	ASCII text
4	True Wind Direction	45.64	degrees
5	Relative Wind Speed	15.53	m/s
6	Relative Wind Direction	325.29	degrees
7	True Wind Speed	14.45	m/s
8	Check sum	*68	ASCII text

Solar Radiometers

Photosynthetic Active Radiation (PAR) Sensor

Photosynthetic Active Radiation Microeinstens/m2 sec and volts from the surface PAR sensor on top of HCO.

./suface_par

Surface-PAR_20080312-000000.Raw

03/12/2008,22:02:46.872,$PSSPA,1749.51,1.056*4C

03/12/2008,22:02:48.872,$PSSPA,1755.43,1.060*47

03/12/2008,22:02:50.888,$PSSPA,1755.43,1.060*47

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/12/2008	mm/dd/year
2	SCS logged Time GMT	22:02:46.872	hh:mm:ss.sss
3	NMEA header	$PSSPA	ASCII text
4	Surface PAR	1749.51	MicroEinstiens sec /m*2
5	Surface PAR	1.056	Volts
6	Check sum	*4C	ASCII text

Solar Radiometers (Short and Long Wave), Pyranometer and Pyrgeometer

Solar Radiometers data from the sensors on top of HCO. The short wave radiometer is the Pyranometer and the Long wave radiometer is the Pyrgeometer.

/solar_radiometers

SRM_20080314-000000.Raw

03/14/2008,12:31:43.329,$PSSRA,1.20,0.010,338.30,0.034,276.02,1.192,275.97,1.194*44

03/14/2008,12:31:45.329,$PSSRA,1.20,0.010,338.30,0.034,276.02,1.192,275.97,1.194*44

03/14/2008,12:31:47.328,$PSSRA,1.20,0.010,339.20,0.037,276.02,1.192,275.97,1.194*47

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/14/2008	mm/dd/year
2	SCS logged Time GMT	12:31:43.329	hh:mm:ss.sss
3	NMEA header	$PSSRA	ASCII text
4	Short Wave Radiation	1.20	W/m*2
5	Short Wave Radiation, RAW	0.010	millivolts
6	Long Wave Radiation (LWR)	338.30	W/m*2
7	LWR, RAW	0.034	millivolts
8	LWR, Dome temperature	276.02	Degrees Kelvin
9	LWR, Some temp, RAW	1.192	volts
10	LWR, Body temperature	275.97	Degrees Kelvin
11	LWR, Body temp, RAW	1.194	volts
12	Check sum	*44	ASCII text

Oceanographic Data

Thermosalinograph / Fluorometer

Forward Thermosalinograph / Fluorometer

Thermosalinograph and sound velocity data from the seawater intake.

./tsg_fwd

TSGFWD_20080313-000000.

03/13/2008,03:11:07.183, 2.0196, 2.79254, 31.4173, 1453.481

03/13/2008,03:11:09.183, 2.0203, 2.79263, 31.4177, 1453.484

03/13/2008,03:11:11.168, 2.0210, 2.79274, 31.4184, 1453.489

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	03:11:07.183	hh:mm:ss.sss
3	RemoteTemperature (Sea Chest intake)	2.0196	Celsius
4	Conductivity	2.79254	Siemens/meter
5	Salinity	31.4173	PSU
6	Sound Velocity	1453.481	Meters per Second (m/s)

TSG A

Thermosalinograph data from the A TSG instruments in the Bio Chem Lab.

/tsg_a

TSG-A_20080313-000000.Raw

03/13/2008,04:46:03.355,$PSTSA,2.565,28.4522,31.526,1456.01*7E

03/13/2008,04:46:05.340,$PSTSA,2.566,28.4529,31.526,1456.02*75

03/13/2008,04:46:07.355,$PSTSA,2.565,28.4519,31.525,1456.01*75

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	04:46:03.355	hh:mm:ss.sss
3	NEMA header	,$PSTSA	ASCII text
4	Temperature	2.565	Celsius
5	Conductivity	28.4522	Siemens/meter
6	Salinity	31.526	PSU
7	Sound Velocity	1456.01	Meters per Second (m/s)
8	Check sum	*7E	ASCII text

TSG B

Thermosalinograph data from the B TSG instruments in the Bio Chem Lab.

/tsg_b

TSG-B_20080313-000000.Raw

03/13/2008,04:46:03.355,$PSTSB,2.565,28.4522,31.526,1456.01*7E

03/13/2008,04:46:05.340,$PSTSB,2.566,28.4529,31.526,1456.02*75

03/13/2008,04:46:07.355,$PSTSB,2.565,28.4519,31.525,1456.01*75

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	04:46:03.355	hh:mm:ss.sss
3	NEMA header	,$PSTSB	ASCII text
4	Temperature	2.565	Celsius
5	Conductivity	28.4522	Siemens/meter
6	Salinity	31.526	PSU
7	Sound Velocity	1456.01	Meters per Second (m/s)
8	Check sum	*7E	ASCII text

Sea Surface Temperature

Sea surface temperature from the Science sea water intake..

/Surface_temp

Sea-Surface_20080313-000000.Raw

03/13/2008,05:46:40.402,$PSSTA,2.039,2945.900*7E

03/13/2008,05:46:42.402,$PSSTA,2.039,2945.900*7E

03/13/2008,05:46:44.402,$PSSTA,2.039,2945.900*7E

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	05:46:40.402	hh:mm:ss.sss
3	NEMA header	$PSSTA	ASCII text
4	Surface temperature (Sea Chest)	2.039	Celsius
5	Temperature, RAW	2945.900	volts
6	Check sum	*7E	ASCII text

Theromsalinograph Flowmeter A

Flow meter A data from the A TSG instruments in the Bio/Chem Lab.
/flomet_a

FlowMeter-A_20080314-000000.Raw

03/14/2008,13:44:44.640,$PSFMA,2.51,38.000*44

03/14/2008,13:44:46.624,$PSFMA,2.64,40.000*4D

03/14/2008,13:44:48.624,$PSFMA,2.64,40.000*4D

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/14/2008	mm/dd/year
2	SCS logged Time GMT	13:44:44.640	hh:mm:ss.sss
3	NEMA header	$PSFMA	ASCII text
4	Flow meter	2.51	Liters/minute
5	Flow meter, RAW	38.000	frequency
6	Check sum	*44	ASCII text

Theromsalinograph Flowmeter B

Flowmeter B data from the B TSG instruments in the Bio/Chem Lab.
/flomet_b

TSG-B_20080313-000000.Raw

03/13/2008,02:51:49.277,$PSFMB,2.91,15.000*44

03/13/2008,02:51:51.277,$PSFMB,2.91,15.000*44

03/13/2008,02:51:53.261,$PSFMB,2.91,15.000*44

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	02:51:49	hh:mm:ss.sss
3	NEMA header	$PSFMB	ASCII text
4	Flowmeter	2.91	Liters/minute
5	Flowmeter, RAW	15.000	frequency
6	Check sum	*44	ASCII text

Oxygen Sensor A

Oxygen A data from the A TSG instruments in the Bio/Chem Lab.
/oxygen_a

OXYGEN-A_20080313-000000.Raw

03/13/2008,05:25:28.371,$PSOXA,7.265,2.922,2.576,2.576*58

03/13/2008,05:25:30.386,$PSOXA,7.265,2.922,2.577,2.577*58

03/13/2008,05:25:32.371,$PSOXA,7.268,2.923,2.576,2.576*54

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	05:25:28.371	hh:mm:ss.sss
3	NEMA header	$PSOXA	ASCII text
4	Oxygen	7.265	ml/l
5	Oxygen, RAW	2.922	
6	Oxygen Temperature	2.576	Celsius
7	Oxygen Temperature, Raw	2.576	volts
8	Check sum	*58	ASCII text

Oxygen Sensor B

Oxygen B data from the B TSG instruments in the Bio/Chem Lab.
NOT USED on HLY0801
/oxygen_b

OXYGEN-B_20080313-000000.Raw

03/13/2008,05:25:28.371,$PSOXB,7.265,2.922,2.576,2.576*58

03/13/2008,05:25:30.386,$PSOXB,7.265,2.922,2.577,2.577*58

03/13/2008,05:25:32.371,$PSOXB,7.268,2.923,2.576,2.576*54

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	05:25:28.371	hh:mm:ss.sss
3	NEMA header	$PSOXB	ASCII text
4	Oxygen	7.265	ml/l
5	Oxygen, RAW	2.922	
6	Oxygen Temperature	2.576	Celsius
7	Oxygen Temperature, Raw	2.576	volts
8	Check sum	*58	ASCII text

Theromsalinograph Flurometer A

Flurometer A data from the A TSG instruments in the Bio/Chem Lab.
/fluro_a

Fluro-A_20080313-000000.Raw

03/13/2008,03:19:57.277,$PSFLA,0.330,0.033,0.000, 0.010*49

03/13/2008,03:19:59.277,$PSFLA,0.330,0.033,0.000,0.010*49

03/13/2008,03:20:01.277,$PSFLA,0.360,0.036,0.000,0.010*49

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	03:19:57.277	hh:mm:ss.sss
3	NEMA header	$PSFLA	ASCII text
4	Flurometer	0.330	Ug/l
5	Flrometer, RAW	0.033	volts
6	Turbidity	0.000	NTU
7	Turbidity, RAW	0.010	volts
8	Check sum	*49	ASCII text

Theromsalinograph Flurometer B

Flurometer B data from the B TSG instruments in the Bio/Chem Lab.
/fluro_b

Fluro-B_20080313-000000.Raw

3/13/2008,03:24:49.293,$PSFLB,0.910,0.091,0.200,0.020*4B

03/13/2008,03:24:51.293,$PSFLB,0.910,0.091,0.200,0.020*4B

03/13/2008,03:24:53.308,$PSFLB,0.910,0.091,0.200,0.020*4B

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	03:24:49.293	hh:mm:ss.sss
3	NEMA header	$PSFLB	ASCII text
4	Flurometer	0.910	Ug/l
5	Flrometer, RAW	0.091	volts
6	Turbidity	0.200	NTU
7	Turbidity, RAW	0.020	volts
8	Check sum	*4B	ASCII text

Transmissometer

Transmissometer TSG instruments in the Bio/Chem Lab.
/trans

Fluro-B_20080313-000000.Raw

3/13/2008,03:24:49.293,$PSFLB,0.910,0.091,0.200,0.020*4B

03/13/2008,03:24:51.293,$PSFLB,0.910,0.091,0.200,0.020*4B

03/13/2008,03:24:53.308,$PSFLB,0.910,0.091,0.200,0.020*4B

THIS IS YET TO BE FORMATTED AND LOGGED

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	03:24:49.293	hh:mm:ss.sss
3	NEMA header	$PSFLB	ASCII text
4	Flurometer	0.910	Ug/l
5	Flrometer, RAW	0.091	volts
	Turbidity	0.200	NTU
	Turbidity, RAW	0.020	volts
6	Check sum	*4B	ASCII text

ISUS Nitrate Sensor

ISUS Nitrate Sensor TSG instruments in the Bio/Chem Lab.
NOT USED on HLY0801
/isus

Isus_20080313-000000.Raw

03/13/2008,00:01:09.247,$PSNTA,0.000,0.000*58

03/13/2008,00:01:11.247,$PSNTA,0.000,0.000*58

03/13/2008,00:01:13.247,$PSNTA,0.000,0.000*58

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/13/2008	mm/dd/year
2	SCS logged Time GMT	00:01:09.247	hh:mm:ss.sss
3	NEMA header	$PSNTA	ASCII text
4	ISUS Aux 1	0.000	volts
5	ISUS Aux 2	0.000	volts
6	Check sum	*58	ASCII text

Sonar Data

Seabeam 2112 Center Beam

Center depth data derived from the Seabeam 2112 data on the POSMVNAV computer.

./seabeam_center

Seabeam-Centerbeam_20070414-182437.Raw

04/14/2007,18:24:38.427,$SBCTR,2007,4,14,18:24:35.713,58.119110,-169.839278,70.70,60*00

04/14/2007,18:24:40.177,$SBCTR,2007,4,14,18:24:37.213,58.119152,-169.839367,70.49,61*00

04/14/2007,18:24:40.615,$SBCTR,2007,4,14,18:24:38.734,58.119193,-169.839452,70.92,60*00

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:40.615	hh:mm:ss.sss
3	NMEA header	$SBCTR	ASCII text
4	Seabeam Date	2007,	Year
5	Seabeam Date	4	month
6	Seabeam Date	14	day
7	Seabeam Time	18:24:38.734	hh:mm:ss.sss
8	Latitude	58.119193	Degrees
9	Longitude	-169.839452	Degrees
10	Depth	70.92	meters
11	Number of Beams	60	
12	Check sum	*00	

Knudsen

3.5 kHz

Depth data in a proprietary PKEL format received from Knudsen 320 B/R serial output.

./knudsen

Knudsen_20070414-182437.Raw

04/14/2007,18:24:38.099,$PKEL99, ,14042007,182524.248,00192,HF,00.00,0,+008.50, LF,73.24,1,+008.50,1500, , ,58 07.123897N,169 50.315830W,1060*12

04/14/2007,18:24:38.349,$PKEL99, ,14042007,182525.759,00191,HF,00.00,0,+008.50,LF,73.22,1,+008.50,1500,------, ,58 07.127267N,169 50.322883W,0565*1F

04/14/2007,18:24:39.865,$PKEL99, ,14042007,182527.269,00191,HF,00.00,0,+008.50,LF,73.22,1,+008.50,1500, , ,58 07.128948N,169 50.326409W,1078*10

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:39.865	hh:mm:ss.sss
3	NMEA header	$PKEL99	ASCII text
4	Record Number???	------	
5	Knudsen Date	14042007	DDMMYYYY
6	Knudsen Time	182527.269	HHMMSS.sss
7		00191	
8	HF Header (12 kHz)	HF	ASCII text
9	HF Depth to Surface	00.00	Meters *
10	HF Draft	,+008.50	Meters
11	LF Header	LF	ASCII text
12	LF Depth to Surface	73.22	Meters *
13	LF Depth Valid Flag	1	ASCII integer
14	LF Draft	+008.50	Meters
15	Sound Speed	1500	Meters Per Second**
18	Latitude	58 07.128948N	DD MM.MMMMMM***
19	Longitude	169 50.326409W	DDD MM.MMMMMM***
20	Position Latency	1078	

21	Checksum	*10	

* Knudsen depth is currently set for XXXXXXX Meters

** Knudsen default sound speed 1500 meters/sec.

*** Current GPS source is the POS/MV

Winch data

Starboard A-Frame Winch Data

1 second data from the Starboard A Frame winch data output.

./sbd_a_frame

Stbd-A-Frame_20070418-000000.Raw

04/18/2007,06:13:18.281,01, 890, , 36, , -27, ,0000

04/18/2007,06:13:19.250,01, 890, , 35, , -28, ,0000

04/18/2007,06:13:20.235,01, 900, , 35, , -28, ,0000

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/18/2007	mm/dd/year
2	SCS logged Time GMT	06:13:20.235	hh:mm:ss.sss
3	Winch number	01	
4	Wire tension	900	Pounds
5	Wire out	35	Meters
7	Wire speed	-28	Meters/minute

Aft A-Frame Winch Data

1 second data from the Aft A Frame winch data output.

./aft_a_frame

Aft-A-Frame_20070418-000000.Raw

04/18/2007,08:46:45.844,02, -160, , 31, , 58, ,0000

04/18/2007,08:46:46.844,02, -160, , 32, , 60, ,0000

04/18/2007,08:46:47.812,02, -160, , 33, , 60, ,0000

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/18/2007	mm/dd/year
2	SCS logged Time GMT	08:46:47.812	hh:mm:ss.sss
3	Winch number	02	
4	Wire tension	-160	Pounds
5	Wire out	33	Meters
7	Wire speed	60	Meters/minute

Navigational Data

POSMV

POSMV GGA

Position data in NMEA GGA format from the POS/MV.

./posmv_gga

POSMV-GGA_20070415-000000.Raw

04/15/2007,00:00:03.052,$INGGA,000002.737,5830.47054,N,17012.64182,W,2,08,1.0,1.80,M,,,4,0297*07

04/15/2007,00:00:04.052,$INGGA,000003.737,5830.47385,N,17012.64365,W,2,08,1.0,1.76,M,,,5,0297*0A

04/15/2007,00:00:05.052,$INGGA,000004.737,5830.47716,N,17012.64550,W,2,08,1.0,1.71,M,,,6,0297*07

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.052	hh:mm:ss.sss
3	NMEA header	$INGGA	ASCII text
4	GPS time at position GMT	000004.737	hhmmss.sss
5	Latitude	5830.47716	ddmm.mmmmm
6	North (N) or South(S)	N	ASCII character
7	Longitude	17012.64550	dddmm.mmmmm
8	East (E) or West (W)	W	ASCII character
9	GPS Quality: 1 = GPS2=DGPS	2	
10	Number of GPS Satellites Used	08	
11	HDOP (horizontal dilution of precision)	1.0	
12	Antenna height	1.71	meters
13	M for Meters	M	
14	Geoidal Height		meters
15	M for Meters		
16	Differential reference station ID	0297	
17	Checksum	*07	

POSMV Psuedo Noise

Psuedorange error statistics in NMEA GST format from the POS/MV.

./posmv_gst

POSMV-Pseudo-Noise_20070415-000000.Raw

04/15/2007,00:00:02.990,$INGST,000002.737,,0.6,0.4,22.3,0.4,0.6,0.8*63

04/15/2007,00:00:03.990,$INGST,000003.737,,0.6,0.4,22.3,0.4,0.6,0.8*62

04/15/2007,00:00:04.990,$INGST,000004.737,,0.6,0.4,22.3,0.4,0.6,0.8*65

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.052	hh:mm:ss.sss
3	NMEA header	$INGST	ASCII text
4	GPS time at position GMT	000004.737	hhmmss.sss
5			
6	Smjr.smjr	0.6	meters
7	Smnr.smnr	0.4	meters
8	000.0	22.3	
9	l.l	0.4	meters
10	y.y	0.6	meters
11	Standard deviation of altitude (a.a)	0.8	meters
12	Checksum	*65	ACII text

POSMV HDT

Heading data in NMEA HDT format from the POS/MV.

./posmv_hdt

POSMV-HDT_20070415-000000.Raw

04/15/2007,00:00:03.083,$INHDT,344.2,T*24

04/15/2007,00:00:04.083,$INHDT,344.2,T*24

04/15/2007,00:00:05.083,$INHDT,344.2,T*24

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.083	hh:mm:ss.sss
3	NMEA header	$INHDT	ASCII text
4	Heading	344.2	Degrees
5	True(T) or Magnetic(M)	T	ASCII character
6	Checksum	*24	ASCII text

POSMV PASHR

Pitch and Roll data in NMEA PASHR format from the POS/MV.

./posmv_pashr

POSMV-PASHR_20070415-000000.Raw

04/15/2007,00:00:02.912,$PASHR,000002.737,344.17,T,-0.21,0.10,-0.02,0.017,0.017,0.011,2,1*17

04/15/2007,00:00:03.912,$PASHR,000003.737,344.19,T,-0.22,0.10,-0.02,0.017,0.017,0.011,2,1*1B

04/15/2007,00:00:04.912,$PASHR,000004.737,344.20,T,-0.24,0.10,-0.02,0.017,0.017,0.011,2,1*10

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.052	hh:mm:ss.sss
3	NMEA header	$PASHR	ASCII text
4	Time GMT	000004.737	hhmmss.sss
5	Heading	344.20	heading
6	True	T	ASCII character
7	Roll	-0.24	Degrees
8	Pitch	0.10	Degrees
9	Heave	-0.02	Degrees
10	Accuracy roll	0.017	Degrees
11	Accuracy pitch	0.017	Degrees
12	Accuracy heading	0.011	Degrees
13	Accuracy of heading 0-no aiding, 1-GPS 2= GPS & GAMS	2	ASCII integer
14	IMU 0= out 1= satisfactory	1	ASCII character
15	Check Sum	*10	ASCI text

POSMV VTG

Course and speed over ground in NMEA VTG format from the POS/MV.

./posmv_vtg

POSMV-VTG_20070415-000000.Raw

04/15/2007,00:00:03.130,$INVTG,343.7,T,,M,12.5,N,23.1,K*75

04/15/2007,00:00:04.130,$INVTG,344.0,T,,M,12.5,N,23.1,K*75

04/15/2007,00:00:05.115,$INVTG,344.2,T,,M,12.5,N,23.1,K*77

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.115	hh:mm:ss.sss
2	NMEA header	$INVTG	ASCII text
3	Heading	344.2	Degrees
4	Degrees true (T)	T	ASCII character
5	Heading		Degrees
6	Degrees magnetic	M	ASCII character
7	Ship Speed	12.5	knots
8	N=Knots	N	ASCII character
9	Ship Speed	23.1	km/hr
10	K=KM per hour	K	ASCII character
11	Check sum	*77	ASCII text

POSMV ZDA

Time and date data in NMEA ZDA format from the POS/MV.

./posm_zda

POSMV-ZDA_20070415-000000.Raw

04/15/2007,00:00:03.162,$INZDA,000003.0016,15,04,2007,,*77

04/15/2007,00:00:04.162,$INZDA,000004.0016,15,04,2007,,*70

04/15/2007,00:00:05.162,$INZDA,000005.0016,15,04,2007,,*71

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.162	hh:mm:ss.sss
2	NMEA header	$INZDA	ASCII text
3	Time UTC	000005.0016	HHMMSS.ssss
4	Day	15	DD
5	Month	04	MM
6	Year	2007	Year
7	??		??
8	??	00	??
9	Checksum	*71	ASCII text

Ashtech GPS

Ashtech Attitude

Attitude in NMEA format from the Ashtech ADU5 GPS receiver.

./ashtech_attiude

Ashtech-Attitude_20070415-000000.Raw

04/15/2007,00:00:03.490,$GPPAT,000003.00,5830.44196,N,17012.62728,W,00030.21,344.3730,000.25,-000.01,0.0015,0.0074,0*42

04/15/2007,00:00:04.490,$GPPAT,000004.00,5830.44527,N,17012.62914,W,00030.23,344.3537,000.20,-000.06,0.0015,0.0071,0*4A

04/15/2007,00:00:05.490,$GPPAT,000005.00,5830.44859,N,17012.63099,W,00030.23,344.3431,000.22,-000.07,0.0014,0.0077,0*41

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.490	hh:mm:ss.sss
3	NMEA header	$GPPAT	ASCII text
4	GPS time at position GMT	000005.00	hhmmss.ss
5	Latitude	5830.44859	ddmm.mmmmm
6	North (N) or South(S)	N	ASCII character
7	Longitude	17012.63099	dddmm.mmmmm
8	East (E) or West (W)	W	ASCII character
9	Altitude	00030.23	Meters
10	Heading	344.3431	Degrees
11	Pitch	000.22	Degrees
12	Roll	-000.07	degrees
13	Attitude phase measurement rms error, MRMS	0.0014	meters
14	Attitude baseline length rms error, BRMS	0.0077	meters
15	Attitude reset flag (0:good attitude, 1:rough estimate or bad attitude)	0	ASCII integer
16	Check sum	*41	ASCII text

Ashtech GGA

Position data in NMEA GGA format from the Ashtech ADU5 GPS receiver.

./ashtech_gga

Ashtech-GGA_20070415-000000.Raw

04/15/2007,00:00:02.333,$GPGGA,000002.00,5830.43864,N,17012.62542,W,1,13,0.7,20.74,M,9.47,M,,*73

04/15/2007,00:00:03.333,$GPGGA,000003.00,5830.44196,N,17012.62728,W,1,13,0.7,20.75,M,9.47,M,,*7E

04/15/2007,00:00:04.333,$GPGGA,000004.00,5830.44527,N,17012.62914,W,1,13,0.7,20.76,M,9.47,M,,*75

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:04.333	hh:mm:ss.sss
3	NMEA header	$GPGGA	ASCII text
4	GPS time at position GMT	000004.00	hhmmss.ss
5	Latitude	5830.44527	ddmm.mmmmm
6	North (N) or South(S)	N	ASCII character
7	Longitude	17012.62914	dddmm.mmmmm
8	East (E) or West (W)	W	ASCII character
9	GPS Quality: 1 = GPS 2=DGPS	1	ASCII integer
10	Number of GPS Satellites Used	13	
11	HDOP (horizontal dilution of precision)	0.7	
12	Antenna height	20.76	meters
13	M for Meters	M	ASCII character
14	Geoidal Height	9.47	meters
15	M for Meters	M	ASCII character
16	Differential reference station ID (no data in sample string)		
17	Checksum	*75	ASCCII text

Ashtech GGL

Position data in NMEA GLL format from the Ashtech ADU5 GPS receiver.

./ashtech_ggl

Ashtech-GLL_20070415-000000.Raw

04/15/2007,00:00:03.271,$GPGLL,5830.44196,N,17012.62728,W,000003.00,A,A*74

04/15/2007,00:00:04.255,$GPGLL,5830.44527,N,17012.62914,W,000004.00,A,A*7C

04/15/2007,00:00:05.255,$GPGLL,5830.44859,N,17012.63099,W,000005.00,A,A*74

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.255	hh:mm:ss.sss
3	NMEA header	$GPGLL	ASCI text
4	Latitude	5830.44859	ddmm.mmmmm
5	North or South	N	ASCII character
6	Longitude	17012.63099	dddmm.mmmmm
7	East or West	W	ASCII character
8	GMT of Position	000005.00	hhmmss.ss
9	Status of data (A=valid)	A	ASCII character
10	???	A	
11	Checksum	*74	ASCII text

Ashtech HDT

Heading data in NMEA HDT format from the Ashtech ADU5 GPS receiver.

./ashtech_hdt

Ashtech-HDT_20070415-000000.Raw

04/15/2007,00:00:03.505,$GPHDT,344.373,T*31

04/15/2007,00:00:04.505,$GPHDT,344.354,T*34

04/15/2007,00:00:05.505,$GPHDT,344.343,T*32

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.505	hh:mm:ss.sss
3	NMEA header	$GPHDT	ASCII text
4	Heading	344.343	Degrees
5	True(T) or Magnetic(M)	T	ASCII character
6	Checksum	*32	ASCII text

PCode

PCode AFT

PCode Aft GGA

Position data in NMEA GGA format from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_gga

PCode-AFT-GGA_20070415-000000.Raw

04/15/2007,00:00:03.443,$GPGGA,000002.522,5830.4417,N,17012.6249,W,1,04,1.5,019.8,M,-008.9,M,,*51

04/15/2007,00:00:04.427,$GPGGA,000003.522,5830.4450,N,17012.6267,W,1,04,1.5,019.8,M,-008.9,M,,*5F

04/15/2007,00:00:05.427,$GPGGA,000004.522,5830.4483,N,17012.6286,W,1,04,1.5,019.8,M,-008.9,M,,*59

FIELD	DATA	Examples	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.427	h:mm:ss.sss
3	NMEA header	$GPGGA	ASCII text
4	GPS time at position GMT	000004.522	hhmmss.ss
5	Latitude	5830.4483	ddmm.mmmm
6	North (N) or South(S)	N	ASCII character
7	Longitude	17012.6286	dddmm.mmmm
8	East (E) or West (W)	W	ASCII character
9	GPS Quality: 1 = GPS 2=DGPS	1	ASCII integer
10	Number of GPS Satellites Used	04	
11	HDOP (horizontal dilution of precision)	1.5	
12	Antenna height	019.8	meters
13	M for Meters	M	ASCII character
14	Geoidal Height	-008.9	meters
15	M for Meters	M	ASCII character
16	Differential reference station ID (no data in sample string)		
17	Checksum	*59	ASCII text

PCode Aft GLL

Position data in NMEA GLL format from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_gll

Pcode-AFT-GLL_20070415-000000.Raw

04/15/2007,00:00:03.474,$GPGLL,5830.4417,N,17012.6249,W,000002.522,A*25

04/15/2007,00:00:04.474,$GPGLL,5830.4450,N,17012.6267,W,000003.522,A*2

04/15/2007,00:00:05.490,$GPGLL,5830.4483,N,17012.6286,W,000004.522,A*2D

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.490	hh:mm:ss.sss
3	NMEA header	$GPGLL	ASCI text
4	Latitude	5830.4483	ddmm.mmmm
5	North or South	N	ASCII character
6	Longitude	17012.6286	dddmm.mmmm
7	East or West	W	ASCII character
8	GMT of Position	000004.522	hhmmss.sss
9	Status of data (A=valid)	A	ASCII character
10	Checksum	*2D	ASCVII text

PCode AFT VTG

Course and speed over ground in NMEA VTG format from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_vtg

Pcode-AFT-VTG_20070415-000000.Raw

04/15/2007,00:00:03.537,$GPVTG,343.7,T,331.4,M,012.4,N,023.0,K*4E

04/15/2007,00:00:04.537,$GPVTG,343.6,T,331.3,M,012.5,N,023.1,K*48

04/15/2007,00:00:05.537,$GPVTG,343.6,T,331.3,M,012.4,N,023.0,K*48

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.537	hh:mm:ss.sss
2	NMEA header	$GPVTG	ASCI text
3	Heading	343.6	Degrees
4	Degrees true (T)	T	ASCII character
5	Heading	331.3	Degrees
6	Degrees magnetic	M	ASCII character
7	Ship Speed	012.4	knots
8	N=Knots	N	ASCII character
9	Ship Speed	023.0	km/hr
10	K=KM per hour	K	ASCII character
11	Check sum	*48	ASCII text

PCode AFT ZDA

Time and date data in the NMEA ZDA format. Data retrieved from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_zda

Pcode-AFT-ZDA_20070415-000000.Raw

04/15/2007,00:00:03.224,$GPZDA,000003.00,15,04,2007,00,00,*4C

04/15/2007,00:00:04.224,$GPZDA,000004.00,15,04,2007,00,00,*4B

04/15/2007,00:00:05.224,$GPZDA,000005.00,15,04,2007,00,00,*4A

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.537	hh:mm:ss.sss
2	NMEA header	$GPZDA	ASCII text
3	Time UTC	000005.00	hhmmss.sss
4	Day	15	DD
5	Month	04	MM
6	Year	2007	Year
7	??	00	??
8	??	00	??
9	Checksum	*4A	ASCII text

PCode Bridge

PCode Bridge GGA

Position data in NMEA GGA format from the Trimble GPS receiver located on the bridge.

./pcode_bridge_gga

PCode-Bridge-GGA_20070415-000000.Raw

04/15/2007,00:00:03.037,$GPGGA,000002.00,5830.469,N,17012.644,W,1,04,2.666,32.15,M,8.930,M,,*4D

04/15/2007,00:00:05.037,$GPGGA,000004.00,5830.476,N,17012.648,W,1,04,2.667,31.82,M,8.930,M,,*45

04/15/2007,00:00:07.052,$GPGGA,000006.00,5830.482,N,17012.651,W,1,04,2.668,31.55,M,8.930,M,,*41

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.052	hh:mm:ss.sss
3	NMEA header	$GPGGA	ASCII text
4	GPS time at position GMT	000006.00	hhmmss.ss
5	Latitude	5830.482	ddmm.mmm
6	North (N) or South(S)	N	ASCII character
7	Longitude	17012.651	dddmm.mmm
8	East (E) or West (W)	W	ASCII character
9	GPS Quality: 1 = GPS 2=DGPS	1	ASCII integer
10	Number of GPS Satellites Used	04	
11	HDOP (horizontal dilution of precision)	2.668	
12	Antenna height	31.55	meters
13	M for Meters	M	ASCII character
14	Geoidal Height	8.930	meters
15	M for Meters	M	ASCII character
16	Differential reference station ID (no data in sample string)		
17	Checksum	*41	ASCII text

PCode Bridge GLL

Position data in NMEA GLL format from the Trimble GPS receiver located on the bridge.

./pcode_bridge_gll

Pcode-Bridge-GLL_20070415-000000.Raw

04/15/2007,00:00:03.099,$GPGLL,5830.469,N,17012.644,W,000002.00,A*12

04/15/2007,00:00:05.099,$GPGLL,5830.476,N,17012.648,W,000004.00,A*16

04/15/2007,00:00:07.099,$GPGLL,5830.482,N,17012.651,W,000006.00,A*17

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.099	hh:mm:ss.sss
3	NMEA header	$GPGLL	ASCII text
4	Latitude	5830.482	ddmm.mmm
5	North or South	N	ASCII character
6	Longitude	17012.651	dddmm.mmm
7	East or West	W	ASCII character
8	GMT of Position	000006.00	hhmmss.ss
9	Status of data (A=valid)	A	
10	Checksum	*17	ASCII text

PCode Bridge VTG

Course and speed over ground data in NMEA VTG format from the Trimble GPS receiver located on the bridge.

./pcode_bridge_vtg

Pcode-Bridge-VTG_20070415-000000.Raw

04/15/2007,00:00:03.162,$GPVTG,343.9,T,333.8,M,12.46,N,23.08,K*40

04/15/2007,00:00:05.162,$GPVTG,343.8,T,333.8,M,12.49,N,23.12,K*45

04/15/2007,00:00:07.146,$GPVTG,343.9,T,333.8,M,12.48,N,23.11,K*46

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.146	hh:mm:ss.sss
2	NMEA header	$GPVTG	ASCII text
3	Heading	343.9	Degrees
4	Degrees true (T)	T	ASCII character
5	Heading	333.8	Degrees
6	Degrees magnetic	M	ASCII character
7	Ship Speed	12.48	knots
8	N=Knots	N	ASCII character
9	Ship Speed	23.11	km/hr
10	K=KM per hour	K	ASCII character
11	Check sum	*46	ASCII text

Glonass

Glonass GGA

Position data in NMEA GGA format from the GLONASS GPS receiver.

./glonass_gga

Glonass-GGA_20070415-000000.Raw

04/15/2007,00:00:02.412,$GPGGA,000002.00,5830.472078,N,17012.636881,W,1,09,0.9,22.999,M,9.46,M,,*49

04/15/2007,00:00:03.396,$GPGGA,000003.00,5830.475412,N,17012.638716,W,1,09,0.9,23.000,M,9.46,M,,*40

04/15/2007,00:00:04.412,$GPGGA,000004.00,5830.478732,N,17012.640527,W,1,09,0.9,22.932,M,9.46,M,,*4D

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:04.412	hh:mm:ss.sss
3	NMEA header	$GPGGA	ASCII text
4	GPS time at position GMT	000004.00	hhmmss.ss
5	Latitude	5830.478732	ddmm.mmmmmm
6	North (N) or South(S)	N	ASCII character
7	Longitude	17012.640527	dddmm.mmmmmm
8	East (E) or West (W)	W	ASCII character
9	GPS Quality: 1 = GPS 2=DGPS	1	ASCII integer
10	Number of GPS Satellites Used	09	
11	HDOP (horizontal dilution of precision)	0.9	
12	Antenna height	22.932	meters
13	M for Meters	M	ASCII character
14	Geoidal Height	9.46	meters
15	M for Meters	M	ASCII character
16	Differential reference station ID (no data in sample string)		
17	Checksum	*4D	ASCII text

Glassnos GLL

Position data in NMEA GLL format from the GLONASS GPS receiver.

./glassnos_gll

Glonass-GLL_20070415-000000.Raw

04/15/2007,00:00:03.240,$GPGLL,5830.475412,N,17012.638716,W,000003.00,A*12

04/15/2007,00:00:04.255,$GPGLL,5830.478732,N,17012.640527,W,000004.00,A*16

04/15/2007,00:00:05.255,$GPGLL,5830.482216,N,17012.642424,W,000005.00,A*11

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.255	hh:mm:ss.sss
3	NMEA header	$GPGLL	ASCII text
4	Latitude	5830.482216	ddmm.mmmmmm
5	North or South	N	ASCII character
6	Longitude	17012.642424	dddmm.mmmmmm
7	East or West	W	ASCII character
8	GMT of Position	000005.00	hhmmss.ss
9	Status of data (A=valid)	A	ASCII character
10	Checksum	*74	ASCII text

Gyro

Gyro Heading

MK27 Gyro

Heading data in NMEA HDT format from the Sperry MK27 gyrocompass.

./gyro_mk27

Gyro-MK27_20080314-000000.Raw

03/14/2008,00:00:01.467,$HEHDT,53.94,T*24

03/14/2008,00:00:01.577,$HEHDT,53.94,T*24

03/14/2008,00:00:01.671,$HEHDT,53.94,T*24

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/14/2008	mm/dd/year
2	SCS logged Time GMT	00:00:01.467	hh:mm:ss.sss
3	NMEA header	$HEHDT	ASCII text
4	Heading	53.94	degrees
5	True (T) or Magnetic (M)	T	ASCII character
6	Check sum	*24	ASCII text

MK39 Gyro

Heading data in NMEA HDT format from the Sperry MK39 gyrocompass.

./gyro_mk39

Gyro-MK39_20080314-000000.Raw

03/14/2008,00:00:01.327,$INHDT,53.70,T*24

03/14/2008,00:00:01.436,$INHDT,53.70,T*24

03/14/2008,00:00:01.530,$INHDT,53.70,T*24

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/14/2008	mm/dd/year
2	SCS logged Time GMT	00:00:01.327	hh:mm:ss.sss
3	NMEA header	$HEHDT	ASCII text
4	Heading	53.70	degrees
5	True (T) or Magnetic (M)	T	ASCII character
6	Check sum	*24	ASCII text

Waypoints

IBS Waypoints

Waypoints from the Healy's Integrated Bridge System (IBS).

./ibs_waypoints

IBS-WayPoints_20070415-000000.Raw

04/15/2007,00:00:03.193,$NVWPL,6152.68,N,17402.58,W,62*51

04/15/2007,00:00:04.193,$NVWPL,6156.58,N,17422.68,W,63*56

04/15/2007,00:00:05.193,$NVWPL,6202.16,N,17439.96,W,64*52

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.193	hh:mm:ss.sss
3	NMEA header	$NVWPL	ASCII text
4	Latitude	6202.16	ddmm.mm
5	North or South	N	ASCII character
6	Longitude	17439.96	dddmm.mm
7	East or West	W	ASCII character
8	Waypoint number	64	
9	Checksum	*52	ASCII text

Speed Log

Sperry Sped Log

Ground/water speed data from the Sperry Speed Log.

./sperry_speedlog

Sperry-Speedlog_20070415-000000.Raw

04/15/2007,00:00:02.755,$VDVBW,12.32,0.85,A,12.43,0.66,A*5A

04/15/2007,00:00:03.271,$VDVBW,12.33,0.80,A,12.44,0.66,A*59

04/15/2007,00:00:03.771,$VDVBW,12.34,0.78,A,12.45,0.68,A*56

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:03.771	hh:mm:ss.sss
2	NMEA header	$VDVBW	ASCII text
3	Fore-aft Water Speed - = astern	12.34	knots
4	Port-Stbd Water Speed - = port	0.78	knots
5	A= Data Valid V=Invalid	A	ASCII character
6	Fore-aft Bottom Speed - = astern	12.45	knots
7	Port-Stbd Bottom Speed - = port	0.68	knots
8	A= Data Valid V=Invalid	A	ASCII character
9	Checksum	*56	ASCII text

Sound Velocimeter

SV2000

Sound Velocity data from the SV2000 sound velocimeter.

./sv2000

Sound-Velocimeter_20080314-000000.Raw

03/14/2008,00:00:24.999, 1470.87

03/14/2008,00:00:55.030, 1470.87

03/14/2008,00:01:25.045, 1470.87

FIELD	DATA	Example	UNITS
1	SCS logged Date	03/14/2008	mm/dd/year
2	SCS logged Time GMT	00:00:24.999	hh:mm:ss.sss
2	NMEA header	1470.87	Meters/sceond

./Raw

The following sections are in the Raw data directory.

75 KHz ADCP data

./adcp75

The shipboard ADCP system measures currents in the depth range from about 30 to 300 m -- in good weather. In bad weather or in ice, the range is less, and sometimes no valid measurements are made. ADCP data collection occurs on the Healy for the benefit of the scientists on individual cruises and for the long-term goal of building a climatology of current structure in the Ocean.

The ADCP data set collected during this cruise are placed in the directory ./Raw/adcp75. The archive consists of a single file for each day of data collection. The files are named by the cruise HLY0801, a three place number of the sequence in the files, then an extra "_000000", and then an extent for the kind of data in the file. An example of the files for one set is:

FILE NAME	FILE EXTENSION	DEFINITION
HLY0703022_000000	*.ENR*	Raw Binary ADCP Data
HLY0703022_000000	*.ENS*	Binary Adcp Data
HLY0703022_000000	*.ENX*	Binary Ensemble Data
HLY0703022_000000	*.STA*	short term average
HLY0703022_000000	*.LTA*	long term average
HLY0703022_000000	*.N1R*	Raw NMEA ASCII
HLY0703022_000000	*.N2R*	Raw NMEA ASCII
HLY0703022_000000	*.NMS*	Averaged Nav Data
Cruise Name_000008	Copy of .ini	

150 Khz ADCP data

./adcp150

NOT used on HLY0801

The shipboard ADCP system measures currents in the depth range from about 30 to 300 m -- in good weather. In bad weather or in ice, the range is less, and sometimes no valid measurements are made. ADCP data collection occurs on the Healy for the benefit of the scientists on individual cruises and for the long-term goal of building a climatology of current structure in the Ocean.

The ADCP data set collected during this cruise are placed in the directory ./Raw/adcp150. The archive consists of a single file for each day of data collection. The files are named by the cruise HLY0801, a three place number of the sequence in the files, then an extra "_000000", and then an extent for the kind of data in the file. An example of the files for one set is:

FILE NAME	FILE EXTENSION	DEFINITION
HLY0703022_000000	*.ENR*	Raw Binary ADCP Data
HLY0703022_000000	*.ENS*	Binary Adcp Data
HLY0703022_000000	*.ENX*	Binary Ensemble Data
HLY0703022_000000	*.STA*	short term average
HLY0703022_000000	*.LTA*	long term average
HLY0703022_000000	*.N1R*	Raw NMEA ASCII
HLY0703022_000000	*.N2R*	Raw NMEA ASCII
HLY0703022_000000	*.NMS*	Averaged Nav Data

KNUDSEN 320B/R

The Knudsen 320B/R depth sounder can record depth in both 3.5 and 12 kHz mode. The Healy records the 3.5 kHz data (Sub Bottom Profile) underweigh. This data is saved in all of the formats that the Knudsen can record data in. These files are in both ASCII and BINARY format (see the table below). This data is also saved as depth in Datalog/Knudsen.

./knudsenraw

FILENAME	FORMAT	DEFINITION
2007_102_0005_004.keb	Binary	Knudsen Playback File
2007_102_0005_008.kea	Ascii	Log of depth, settings and environmental data
2007_102_0005_HF_001.sgy	Binary	SEG-Y extended Seismic format

Seabeam

The raw Seabeam 2112 files are in this directory. The naming convention uses the year, month, Julian day, and the start hour and minute in it. For year 2007 on day 110 starting at 11:12 the name would be sb20071101112.mb41. mb41 is the MB-System multibeam format number for the Seabeam 2112. These files can best be accessed and used by using the MB-System software.

./Seabeam

sb20071091600.mb41

Thermosalinograph

Thermosalinograph FWD

./tsg_fwd

HLY08TSGFwd0801-2.CON

HLY08TSGFwd0801-2.hex

CTD

Data for the each CTD cast are contained here. These files are in SeaBird software's format. Each cast is in a separately numbered subdirectory.

./ctd

FILENAME	FORMAT	DEFINITION
021.BL	ASCII	Bottle firing information
021.CON	ASCII	The configuration file for the cast
021.HDR	ASCII	Header information for the cast
021.btl	ASCII	Averaged Bottle firing information
021.cnv	ASCII	The data
021.dat	Binary	The data
021.jpg	Binary	Plotted JPEG image of the cast
021.ros	ASCII	Data from when bottles fire
021avg.cnv	ASCII	Meaned 1 meter down cast of the data

Expendable Bathythermograph (XBT)

The file names use the probe type and the sequence number of the XBT or Expendable Sound Velocimeter (XSV in the series used for the cruise.

./xbt

FILENAME	EXTENSION	DEFINITION	PROGRAM REQUIRED to read the file
T5_00014.rdf	.RDF	Raw Data Format	Sippican Software
T5_00014.edf	.EDF	Exportable Data Format	Any text/spreadsheet

./LDS_Data

The Lamont Data Logging System (LDS) outputs it's file to LDS_Data. Below are directories in which data is written to.

Navigation

Navigation data are logged in the format they come from the device with a data source stamp and a time stamp added to them in several directories in LDS_Data. These data strings are in NEMA (National Marine Electronics Association) format. You will need a copy of NMEA 183, Standard for Interfacing Marine Electronics Devices, Version 2.3, March 1, 1998, to help you understand the data formats used. These data are also in the SCS_Data directories that are described above in formats that are explained. The web-site http:/www.gpsinformation.org/dale/nmea.htm might help you understand these formats. Example files will be shown below but no formats will be given.

ADU5 (Ashtech GPS)

Data from the Ashtech GPS is written here as it is from the GPS receiver.

./adu5

HLY0801-adu5.y2008d082

adu5 2008:082:00:00:00.1772 $GPGLL,6222.52645,N,16922.29346,W,000000.00,A,A*7B

adu5 2008:082:00:00:00.2942
$GPGGA,000000.00,6222.52645,N,16922.29346,W,1,11,0.8,18.49,M,7.53,M,,*73

adu5 2008:082:00:00:00.3542 $GPVTG,165.20,T,154.20,M,002.86,N,005.29,K,A*23

adu5 2008:082:00:00:00.4152
$GPPAT,000000.00,6222.52645,N,16922.29346,W,00026.02,150.5834,000.30,001.12,0.0015,0.0093,0*62

adu5 2008:082:00:00:00.4241 $GPHDT,150.583,T*3F

adu5 2008:082:00:00:01.1731 $GPGLL,6222.52568,N,16922.29301,W,000001.00,A,A*75

adu5 2008:082:00:00:01.2901
$GPGGA,000001.00,6222.52568,N,16922.29301,W,1,11,0.8,18.50,M,7.53,M,,*75

adu5 2008:082:00:00:01.2920 $GPVTG,164.37,T,153.37,M,002.96,N,005.47,K,A*2C

adu5 2008:082:00:00:01.4110
$GPPAT,000001.00,6222.52568,N,16922.29301,W,00026.03,150.7601,000.28,001.23,0.0017,0.0118,0*6C

adu5 2008:082:00:00:01.4200 $GPHDT,150.760,T*30

Trimble AGGPS

Navigation data from the AGGPS receiver is written here as it is from the GPS receiver.

./aggps

HLY0801-aggps.y2008d082

aggps 2008:082:00:00:00.2252
$GPGGA,000000.00,6222.525857,N,16922.290938,W,2,07,1.2,21.02,M,8.08,M,5.0,0297*5
4

aggps 2008:082:00:00:00.2832 $GPGLL,6222.525857,N,16922.290938,W,000000.00,A,D*75

aggps 2008:082:00:00:00.3412 $GPVTG,165.5,T,,,002.89,N,005.35,K,D*42

aggps 2008:082:00:00:00.3992
$GPGSV,2,1,07,31,23,093,44,32,25,079,45,23,22,190,46,20,66,229,50*78

aggps 2008:082:00:00:00.4572 $GPGSV,2,2,07,11,51,173,50,14,20,043,42,17,41,279,50,,,,*46

aggps 2008:082:00:00:00.5172 $GPGSA,A,3,31,32,23,20,11,14,17,,,,,,2.6,1.2,2.3*37

aggps 2008:082:00:00:00.5752 $GPZDA,000000.10,22,03,2008,00,00*6E

aggps 2008:082:00:00:00.6332
$GPRMC,000000,A,6222.525857,N,16922.290938,W,002.89,165.5,220308,13.9,E,D*03

aggps 2008:082:00:00:00.6631 $GPGST,000000.00,0.4,1.1,0.9,52.2,1.0,1.0,2.7*6A

aggps 2008:082:00:00:01.2320
$GPGGA,000001.00,6222.525073,N,16922.290454,W,2,07,1.2,20.94,M,8.08,M,3.6,0297*5
2

aggps 2008:082:00:00:01.2902 $GPGLL,6222.525073,N,16922.290454,W,000001.00,A,D*7D

PSOMV Attitude

The Attitude data from the POSMV is written here.

./posatt

HLY0801-posatt.y2008d082

posatt 2008:082:00:00:00.0082 :06000C -0004F 0105 0013

posatt 2008:082:00:00:00.1082 :010007 -0003F 0105 0013

posatt 2008:082:00:00:00.2082 :0A0007 -0003F 0105 0013

posatt 2008:082:00:00:00.3082 :01000C -0004F 0105 0013

posatt 2008:082:00:00:00.4082 :09011E -0003F 0105 0013

posatt 2008:082:00:00:00.5081 :0A000C -0003F 0105 0013

posatt 2008:082:00:00:00.6081 :04011E -0003F 0105 0013

POSMV GPS

The data from the POSMV GPS is written here.

./posnav

HLY0801-posnav.y2008d082

posnav 2008:082:00:00:00.0502 $INZDA,000000.0043,22,03,2008,,*78

posnav 2008:082:00:00:00.1922 $PASHR,000000.069,150.36,T,1.05,0.13,-0.03,0.019,0.019,0.011,2,1*35

posnav 2008:082:00:00:00.1923 $PRDID,0.13,1.05,150.36*7E

posnav 2008:082:00:00:00.2502 $INGST,000000.069,,0.7,0.5,18.0,0.7,0.5,1.1*6F

posnav 2008:082:00:00:00.3112 $INGGA,000000.069,6222.50218,N,16922.26144,W,2,09,0.9,-2.73,M,,,4,0297*23

posnav 2008:082:00:00:00.3642 $INHDT,150.4,T*25

posnav 2008:082:00:00:00.3643 $INVTG,169.7,T,,M,3.0,N,5.5,K*7A

posnav 2008:082:00:00:01.0501 $INZDA,000001.0043,22,03,2008,,*79

posnav 2008:082:00:00:01.1920 $PASHR,000001.069,150.53,T,1.04,0.13,-0.03,0.019,0.019,0.011,2,1*36

POSMV Navigation for the SeaBeam

The SeaBeam only needs specific navigation data. So the POSMV data is reformatted SeaBeam and sent to the SeaBeam for use by it.

./posreform2sb

HLY0801-posreform2sb.y2008d082

posreform2sb 2008:082:00:00:00.366 $NVVBW,3.0,0.1,A,3.0,0.1,A*5B

posreform2sb 2008:082:00:00:00.366 $NVHDT,150.36,T*0B

posreform2sb 2008:082:00:00:00.366 $NVGLL,6222.5022,N,16922.2614,W,000000.07,A*10

posreform2sb 2008:082:00:00:01.366 $NVVBW,3.1,0.1,A,3.1,0.1,A*5B

posreform2sb 2008:082:00:00:01.366 $NVHDT,150.53,T*08

posreform2sb 2008:082:00:00:01.366 $NVGLL,6222.5014,N,16922.2611,W,000001.07,A*11

posreform2sb 2008:082:00:00:02.368 $NVVBW,3.2,0.1,A,3.2,0.1,A*5B

SeaBeam Data

SeaBeam Center Beam Data

The data from the SeaBeam's center beam is stripped out of the data file and used for displays around the ship. This data is also available as described above.

./sbctr

HLY0801-sbctr.y2008d082

sbctr 2008:082:00:00:03.8623 $SBCTR,2008,3,22,00:00:01.222,62.375023,-169.371017,33.82,43*00

sbctr 2008:082:00:00:05.3697 $SBCTR,2008,3,22,00:00:02.742,62.375000,-169.371010,33.92,51*00

sbctr 2008:082:00:00:07.7156 $SBCTR,2008,3,22,00:00:04.252,62.374975,-169.371002,36.19,40*00

sbctr 2008:082:00:00:08.1426 $SBCTR,2008,3,22,00:00:05.762,62.374957,-169.370990,33.32,40*00

sbctr 2008:082:00:00:09.8221 $SBCTR,2008,3,22,00:00:07.272,62.374932,-169.370985,31.89,46*00

sbctr 2008:082:00:00:11.6578 $SBCTR,2008,3,22,00:00:08.992,62.374903,-169.370970,32.48,42*00

sbctr 2008:082:00:00:13.5820 $SBCTR,2008,3,22,00:00:10.502,62.374870,-169.370955,34.15,48*00

sbctr 2008:082:00:00:16.1493 $SBCTR,2008,3,22,00:00:13.522,62.374817,-169.370927,34.30,45*00

sbctr 2008:082:00:00:17.6985 $SBCTR,2008,3,22,00:00:15.032,62.374790,-169.370912,33.82,43*00

sbctr 2008:082:00:00:19.5798 $SBCTR,2008,3,22,00:00:16.552,62.374760,-169.370890,33.47,55*00

Speed of Sound in the Surface Water for SeaBeam

The SeaBeam needs the Speed of Sound at the surface. This is calculated from the Sea Chest intake water temperature and the TSG Salinity. The water temperature and Salinity are also in this file.

./sbsv

HLY0801-sbsv.y2008d082

sbsv 2008:082:00:00:00.4142 1439.5, -1.72, 0033.7,0

sbsv 2008:082:00:00:02.4138 1439.5, -1.72, 0033.7,0

sbsv 2008:082:00:00:04.4146 1439.5, -1.72, 0033.7,0

sbsv 2008:082:00:00:06.4222 1439.5, -1.73, 0033.7,0

sbsv 2008:082:00:00:08.3860 1439.5, -1.73, 0033.7,0

sbsv 2008:082:00:00:10.4126 1439.5, -1.73, 0033.7,0

sbsv 2008:082:00:00:12.4142 1439.5, -1.73, 0033.7,0

sbsv 2008:082:00:00:14.4140 1439.5, -1.73, 0033.7,0

sbsv 2008:082:00:00:16.3947 1439.5, -1.73, 0033.7,0

sbsv 2008:082:00:00:18.3864 1439.5, -1.73, 0033.7,0

Raw SeaBeam Files

The Raw SeaBeam data files are here. These are in the SeaBeam 2112 format. To use these files you will need a toll such as the MB-System Software package that can be found at LDEO. The files are named using the year, day in gthe year and time.

./seabeam

sb20080812300.mb41

sb20080820000.mb41

sb20080820100.mb41

sb20080820200.mb41

sb20080820300.mb41

sb20080820400.mb41

sb20080820500.mb41

sb20080820600.mb41

sb20080820700.mb41

sb20080820800.mb41

sb20080820900.mb41

Gyroscope data

There are 2 Sperry Gyroscopes running the MK27 and the MK30 on the ship. These contain heading of the ship.

MK27 Sperry Gyroscope

./mk27

0801-mk27.y2008d082

```
mk27  2008:082:00:00:0.0556  $HEHDT,150.94,T*16
mk27  2008:082:00:00:0.1452  $HEHDT,150.95,T*17
mk27  2008:082:00:00:0.1876  $HEROT,7.07,A*1B
mk27  2008:082:00:00:0.3013  $HEXDR,A,150.95,D,HDG,A,-0.97,D,ROLL,A,-0.24,D,PITCH*48
mk27  2008:082:00:00:0.3432  $HEHDT,150.97,T*15
mk27  2008:082:00:00:0.3855  $HEHDT,150.98,T*1A
mk27  2008:082:00:00:0.4516  $HEHDT,151.00,T*1A
mk27  2008:082:00:00:0.5452  $HEHDT,151.02,T*18
mk27  2008:082:00:00:0.6495  $HEHDT,151.03,T*19
mk27  2008:082:00:00:0.6936  $HEROT,8.06,A*15
mk27  2008:082:00:00:0.7453  $HEHDT,151.05,T*1F
```

MK30 Sperry Gyroscope

./mk30

HLY0801-mk30.y2008d082

```
mk30  2008:082:00:00:00.0159  $INHDT,150.68,T*1F
mk30  2008:082:00:00:00.0666  $INROT,9,A*36
mk30  2008:082:00:00:00.1142  $INHDT,150.69,T*1E
mk30  2008:082:00:00:00.1602  $INROT,9,A*36
mk30  2008:082:00:00:00.2205  $INHDT,150.71,T*17
mk30  2008:082:00:00:00.2646  $INROT,9,A*36
mk30  2008:082:00:00:00.3142  $INHDT,150.72,T*14
mk30  2008:082:00:00:00.3623  $INROT,10,A*0E
mk30  2008:082:00:00:00.4186  $INHDT,150.74,T*12
mk30  2008:082:00:00:00.4633  $INROT,10,A*0E
mk30  2008:082:00:00:00.5142  $INHDT,150.76,T*10
mk30  2008:082:00:00:00.5725  $INROT,10,A*0E
mk30  2008:082:00:00:00.6166  $INHDT,150.77,T*11
```

All SIO TSG and MET Data

All of the data from the SIO TSG and Meteorological Sensors are sent in one serial line. All of these data have different NEMA strings and formats. These are listed above. This is a single file for all these data.

./tsg_met

HLY0801-tsg_met.y2008d082

tsg_met 2008:082:00:00:00.3272 $PSSRA,501.80,4.190,349.54,0.257,261.02,1.951,261.51,1.922*4E

tsg_met 2008:082:00:00:00.3275 $PSSPA,1665.98,1.006*43

tsg_met 2008:082:00:00:00.3542 $PSMEA,-11.56,87.90,1022.45,0.03*51

tsg_met 2008:082:00:00:00.3543 $PSWDA,240.50,11.88,243.30,11.08*5C

tsg_met 2008:082:00:00:00.3872 $PSWDB,234.33,10.31,233.57,11.74*57

tsg_met 2008:082:00:00:00.4142 $PSSTA,-1.721,2708.200*52

tsg_met 2008:082:00:00:00.4143 $PSTSA,-1.274,27.0231,33.728,1441.48*5C

tsg_met 2008:082:00:00:00.4432 $PSTSB,,,,*46

tsg_met 2008:082:00:00:00.4432 $PSOXA,7.350,2.768,-1.274,-1.274*5F

tsg_met 2008:082:00:00:00.4433 $PSOXB,,,,*56

tsg_met 2008:082:00:00:00.4732 $PSFLA,0.300,0.030,0.000,0.013*4A

tsg_met 2008:082:00:00:00.5012 $PSFLB,1.150,0.115,0.430,0.043*4B

tsg_met 2008:082:00:00:00.5013 $PSNTA,0.000,0.000*58

tsg_met 2008:082:00:00:00.5311 $PSFMA,3.04,46.000*4C

tsg_met 2008:082:00:00:00.5313 $PSFMB,3.30,17.000*4C

tsg_met 2008:082:00:00:00.5371 $GPZDA,000000.00,22,03,2008,00,00*6F

Gravity

Two Gravimeters are being recorded from the IC no-Gyro room.

BGM221

./bgm221

HLY0801-bgm221.y2008d082

bgm221 2008:082:00:00:00.5731 04:025278 00

bgm221 2008:082:00:00:01.5661 04:025279 00

bgm221 2008:082:00:00:02.5661 04:025279 00

FIELD	DATA	Example	UNITS
1	Data Stream Name	bgm221	ASCII text
2	LDS logged Time GMT	2008:082:00:00:00.5731	yyyy:jjj:hh:mm:ss.sss
3	measurement period in quarters of a second	04	quarters of a second
4	"counts" proportional to observed gravity	025278	counts
5	status flags	00	0 = OK

BGM222

./bgm222

HLY0801-bgm222.y2008d082

bgm222 2008:082:00:00:00.4962 04:025332 00

bgm222 2008:082:00:00:01.5071 04:025333 00

bgm222 2008:082:00:00:02.4960 04:025332 00

FIELD	DATA	Example	UNITS
1	Data Stream Name	bgm222	ASCII text
2	LDS logged Time GMT	2008:082:00:00:00.4962	yyyy:jjj:hh:mm:ss.sss
3	measurement period in quarters of a second	04	quarters of a second
4	"counts" proportional to observed gravity	025332	counts
5	status flags	00	0 = OK

Events in Running LDS

The files here are logs of LDS start and stops of different data loggers.

./events

Some examples files here are:

HLY0801-ev-adcp_nav.y2008d073

HLY0801-ev-adcp_nav.y2008d081

HLY0801-ev-adcp_rph.y2008d073

HLY0801-ev-adcp_rph.y2008d081

HLY0801-ev-adu5.y2008d073

HLY0801-ev-aggps.y2008d073

HLY0801-ev-bgm221.y2008d073

HLY0801-ev-bgm222.y2008d073

This file HLY0801-ev-posreform2sb.y2008d073 contains:

posreform2sb 2008:073:20:22:50.0857 LOGGER_STARTUP N/A starting up...

posreform2sb 2008:073:20:22:50.0857 OTHER N/A succeeded in locking in memory

APPENDIX:

Acquisition Problems and Events

This table summarizes problems with acquisition noted during this cruise including instrument failures, data acquisition system failures and any other factor affecting this data set. Times are reported in GMT. You should look for more complete details for these events in the ELOG accounts.

Date	*Time (UTC)*	*Event*
03/13/08	20:39	Start LDS for HLY0801
03/13/08	21:35	Start SCS ACQ for HLY0801
03/14/08	01:15	Leaving Dock start SeaBeam
03/14/08	01:15	Leaving Dock start Knudsen 3.5
03/14/08	01:29	Science seawater and forward SIO MET sensors turned on
03/14/08	03:10	SRD-500 turned off and pulled in
03/14/08	04:11	Start ActiveXperts
03/14/08	05:41	Start ADCP 75 with "Less_Than_600Meter_Shallow_Water_High_ResolutionWtrigger.txt" configure file
03/14/08	05:59	Stopped Knudsen, start writing files to SeaVenture, restart Knudsen
03/14/08	06:26	Note that Gyro heading to ADCP75 frozen
03/14/08	08:33	Note that Gyro heading to ADCP75 is working again
03/14/08	09:10	Climate Control Chamber's recording paper changed
03/14/08	22:14	New SVP using XBT T7_00006 and mblevitus
03/15/08	00:31	Ashtech HDT & GPPAT drop out
03/15/08	08:06	Stop and start ADCP75 to get primary GGA and VTG again
03/16/08	14:30	Note SIO Winds diverge from RMYoung data. Relative and True words crossed.
03/16/08	19:08	New SVP hly0801_00101.svp from CTD station entered
03/17/08	17:50	Ashtech reset, HDT & GPPAT data back
03/17/08	14:36	New SVP hly0801_00301.svp from CTD station entered
03/19/08	03:11	restart SeaBeam after power outage, new 8mm tape? No SSV old SVP
03/19/08	03:13	Synchro converter to ADCP75 reset about 01:00
03/19/08	03:21	SeaBeam getting SSV now
03/20/08	00:48	Knudsen, ADCP75, ek60, and Knudsen have been very weak. Ice blockage?
03/20/08	00:56	Knudsen, ADCP75, ek60, and Knudsen are now showing good returns
03/20/08	04:40	Noted that on 3/14 the SIO true and relative winds become about the same
03/20/08	05:02	SVP hly0801_00301.svp used for SeaBeam, restarted wrong after shutdown
03/20/08	07:02	New SVP hly0801_01001.svp from CTD station entered
03/20/08	07:42	Science Seawater to BioChem shutdown, no TSG data from BioChem
03/20/08	08:05	SeaBeam to Manual SSV
03/20/08	13:13	Sea Water intake shut off to Bio Chem. Problems with discharge over the side.
03/20/08	13:19	Sea Beam SSV to Manual
03/21/08	00:03	Aloft Con images have stopped around
03/21/08	00:03	Aloft Con images were off 03/19/08 23:45 – 03/20 00:05

Date	*Time (UTC)*	*Event*
03/21/08	01:17	Aloft Con Cam timeserver reset
03/21/08	07:46	ADCP 75 VMDAS program restarted, try to clear up nav warning light
03/21/08	08:02	Stop ADCP 75 VMDAS , stop and restart LDS adcp_rph" and "adcp_nav" loggers, restart VMDAS
03/21/08	20:18	ADCP 75 VMDAS stopped 45 minutes ago, restarted.
03/21/08	22:26	Starting about 3/20/8 01:00 ADU randomly gives -999 heading
03/21/08	23:29	Reset ADU
03/22/08	09:30	Logged that Ultrasonic winds are not giving proper “True” values for most of the leg.
03/22/08	19:08	SeaBeam 8m tapes are ejected. Can not keep them in. Will use disks for the rest of the cruise.
03/22/08	10:12	“True” calculation for Ultrasonic winds is corrected.
03/22/08	21:53	Adjust get_elements in Terascan laptop to get DMSP data.
03/23/08	00:03	Stop and start ADCP75 VMDAS
03/23/08	21:48	Adjust cables into Terascan laptop to get DMSP better data.
03/23/08	01:04	Aloft Conn Camera stopped
03/23/08	01:27	Aloft Conn Camera working
03/24/08	01:50	Logged note cover for ship humidity/Temperature is missing.
03/24/08	08:48	Stop and restart ADCP 75.
03/24/08	13:40	Stop and restart LDS adcp_rph" and "adcp_nav", loggers.
03/24/08	13:46	StopADCP75 VMDAS, stop and restart LDS adcp_rph" and "adcp_nav" loggers, restart ADCP75 VMDAS
03/25/08	23:47	SeaBeam SVP from XBT T7_00006 on 3/14/8 at 21:57
03/26/08	00:28	Gyro synchro converter reset?, gyro heading back in ADCP75.
03/26/08	01:21	ADCP75 writing to local disk. ”Too much data” message gone.
03/26/08	01:57	Port and Starboard Time servers not working.
03/26/08	05:53	SRD-500 back in the water for speed log.
03/26/08	06:27	New SVP from Argo Float R4900806_038, 56.221N, -172.645E, 2008/03/24 1500
03/26/08	06:55	Aft PCODE antenna now used for Time servers. ADCP75 red light on as a result
03/26/08	07:23	SRD-500 turned off ½ hour ago due to interference with fish finder.
03/26/08	16:17	New SVP from Argo Float R4900843_016 created 3/13/8
03/26/08	17:36	SSV did a shift from 1438 – 1455 just now.
03/26/08	22:20	SeaBeam control GUI on skimmer just disappeared but still getting data
03/26/08	22:22	stop ADCP75 VMDAS and copied file to V drive for Dutch arrival
03/26/08	22:25	stop SCS Acquisition.
03/26/08	22:32	Science sea water secured.
03/26/08	22:43	Stop and shutdown SeaBeam.
03/26/08	22:44	Stop Knudsen.
03/26/08	22:47	Stop LDS foe END of HLY0801.

Underway Sensors and Calibrations

Sensors and Calibrations

HLY0801 Shipboard Sensors

Sensor	Description	Serial #	Last Calibration Date	Status
Meteorology & Radiometers				
Port Anemometer	RM Young 09101	L001	02/06/07	Collected
Stbd Anemometer	RM Young 09101	L003	03/07/07	Collected
Barometer	RM Young 612011	BP01643	02/22/08	Collected
Air Temp/Rel. Hum.	RM Young 41382V	13352	02/22/08	Collected
Helo shack PAR	BSI QSR-2200	20270	01/09/07	Collected
Shortwave Radiation	Eppley labs - PSP	35032F3	08/01/07	Collected
Longwave Radiation	Eppley labs - PIR	34955F3	08/17/07	Collected
Barometer	Paroscientific MET3A	101757	06/27/07	Collected
Bow Temperature	Paroscientific MET3A	101757	06/27/07	Collected
Precipitation	Paroscientific MET3A	101757	06/27/07	Collected
Relative Humidity	Paroscientific MET3A	101757	06/27/07	Collected
Jack Staff Ultrasonic Anemometer	RM Young 85004	00703	09/20/07	Collected
Yard Arm Stb Ultrasonic Anemometer	RM Young 85004	00704	09/20/07	Collected
Underway Ocean				
TSG	SeaBird SBE45	0215	08/01/07	Collected
Remote Sea Temp	SeaBird SBE3S	4063	12/13/07	Collected
Fluorometer B	Turner SCUFA	0600	12/15/07	Collected
Fluorometer A	Seapoint SCF	SCF2957	12/15/07	Collected
Oxygen Sensor A	SeaBird SBE-43	1307	09/28/07	Collected
Oxygen Optode- B	Aanderaa Optode 3835	719	11/21/07	Not Collected
Nitrate Sensor	MBARI ISUS v3	141	10/11/07	Not Collected

Sensor	Description	Serial #	Last Calibration Date	Status
Flowmeter A	Flocat C-ES45-B003	09061005	01/07/08	Collected
Flowmeter B	Flocat C-ES45-B003	02030692	01/07/08	Collected
Sonars				
Knudsen- subbottom	320 B/R	K2K-00-0013	N/A	Collected
ADCP 150 kHz	Broad Band (BB150)	80	N/A	Not Collected
ADCP 75 kHz	Ocean Surveyor	172	N/A	Collected
Multibeam	Seabeam 2112	?	N/A	Collected
Speed log	Sperry	?	N/A	Collected some
Navigation				
P-Code GPS (aft)	Trimble Centurion	0220035469	N/A	Collected
Attitude GPS	Ashtech ADU5	AD520033513	N/A	Collected
DGPS	Trimble AGGPS-AG132	0224016199	N/A	Collected
POSMV	Model- MV V4	2306	N/A	Collected
P-Code GPS (fwd)	Rockwell	?	N/A	Collected
Glonass	?	?	N/A	Collected
GYRO 1	Sperry MK39 PN 03956-1982416-2	340	?	Collected
GYRO 2	Sperry MK27A 4800880-1	025	N/A	Collected

HLY0801- CTD Sensors

Sensor	Comments	Serial #	Last service/ Calibration Date	Status
CTD fish	SBE 911plus	639	01/18/08	
Pressure Sensor #1	Digiquartz with TC	83012	01/18/08	Collected
Temperature #1	SBE3- Primary	2855	01/21/08	Collected
Temperature #2	SBE3- Secondary	2796	01/27/08	Collected
Conductivity #1	SBE4- Primary	2619	12/14/07	Collected
Conductivity #2	SBE4- Secondary	2545	12/14/07	Collected
Pump	SBE5 Primary	3115	01/08	NA
Pump	SBE5 Secondary	3112	01/08	NA
Deck Unit	SBE 11-Plus V2	0417	12/07	NA
Altimeter	PSA916	843	01/08	Collected
Oxygen	SBE43	459	12/12/07	Collected
Fluorometer	Chelsea-Aquatrack3	088234	03/07	Collected
Transmisometer	Wetlabs	CST-390DR	01/08	Collected
PAR	Bioshperical QSP2300	70115	01/07	Collected
Carousel	SBE32- 12 place	347	01/08	NA

HLY0801 Sensor Calculations

The coefficients for temperature, conductivity, fluorometer and turbidity sensors can be found in the calibrations sheets below in the Appendix.

Calculating Temperature – ITS-90

T = decimal equivalent of bytes 1-4
Temperature Frequency: f = T/19 +2100
Temperature = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Calculating Conductivity – ITS-90

C = decimal equivalent of bytes 5-8
Conductivity Frequency f = sqrt(C*2100+6250000)
Conductivity = $(g + hf^2 + if^3 + jf^4)/[10(1 + \delta t + \varepsilon p)]$ (siemens/meter)
t = temperature (°C); p = pressure (decibars); δ = Ctcor; ε = CPcor

Calculating Fluorometry Voltage

f = decimal equivalent of bytes 15-17
Fluorometry Voltage = f/819

Calculating Transmittance

V_{dark} = 0.058 V
V_{ref} = 4.765 V
t = decimal equivalent of bytes 18 – 20
Transmissometer Voltage (V_{signal}) = t/819
% Transmittance = $(V_{signal} - V_{dark}) / (V_{ref} - V_{dark})$

Calculating PAR for surface PAR

raw data = mV
calibration scale = 6.08 V/(μEinstiens/cm ^{2}sec)
offset (V_{dark}) = 0.3 mV
(*raw* mV - V_{dark})/scale x 10^4 cm^2/m^2 x 10^{-3} V/mV= μEinstiens/m^2sec
or
(*data* mV – 0.3 mV) x 1.65 (μEinstiens/m^2sec)/mV = μEinstiens/m^2sec

Calculating Pyrgeometer Values

- V = Eppley PIR Thermopile voltage
- S = Sensitivity (Calibration factor from Eppley Cal sheet)
- S = 3.32
- J = Stefan-Boltzmann Constant
- J = 5.6697e-8
- B = [absorption constant (for Eppley Black paint formula) 0.985 / dome glass IR transmission 0.5]
- B= 3.5 for Stock Eppley PIR
- Tb = Eppley Body Temperature in degrees Kelvin
- Td = Eppley Dome Temperature in degrees Kelvin
- Tb and Td calculated as follows:
- T = 1/ (a + ln(Vo/Irt)*(b + c*(ln(Vo/Irt)**2)));
- Irt = (Vref-Vin)/R1
- On Healy R1 = 82500 Vref = 5.0
- a= 0.0010295 b= 0.0002391 c = 1.568e-7
-
- $W/M2 = V/S + (J * Tb^4) + (B*J*(Tb^4 - Td^4))$

Calibrations

The following pages are replicas of current calibration sheets for the sensors used during this cruise.

Meteorology & Radiometers

R.M. Young Wind Bird, Starboard

Serial # L001

R. M. Young Wind bird Calibration Results
Model # 09101, S/N L003 (Starboard Windbird)
As per Young Meteorological Instruments
Wind System Calibration Manual

Date: 07 Mar 07 Technician: ET1 Berringer / ETC Rodda

Wind speed torque: Passed

Maximum toque = 2.4 gm/cm
Test results:
CW 0.7
CCW 0.7

Wind direction torque: Passed

Maximum toque = 30 gm/cm

Test results:
CW 20 gm/cm
CCW 22 gm/cm

Wind speed signal:

Maximum % error = 1%

Test results: Passed

Actual RPM	Actual Wind Speed	Measured	% Error
200	1.90	1.9	0.21
500	4.76	4.8	0.84
1200	11.42	11.4	0.21
3600	34.27	34.3	0.08
5000	47.60	47.6	0.00

Note; Wind speed in knots = 0.00952 * shaft RPM

Wind direction signal:

Maximum error = +/- 2 degrees

Test results: Failed – off by 1 degree

Actual	Meaured	Error
0	358	-2
30	27	3
60	58	2
90	88	2
120	118	2
150	149	1
180	178	2
210	207	3
240	238	2
270	268	2
300	297	3
330	327	3

R.M. Young Wind Bird Port

Serial # L001

R. M. Young Wind bird Calibration Results
Model # 09101, S/N L001 (Port Windbird)

As per Young Meteorological Instruments
Wind System Calibration Manual

Date: 06 Feb 07 Technician: ET3 Daem / ET2 Davis

Wind speed torque: Passed

Maximum toque =2.40 gm/cm

Test results:

CW	.2 gm/cm
CCW	.2 gm/cm

Wind direction torque: Passed

Maximum toque = 30 gm/cm

Test results:

CW	10gm/cm
CCW	10gm/cm

Wind speed signal: Passed

Maximum % error = 1%

Test results:

Actual RPM	Actual Wind Speed	Measured	% Error
200	1.90	1.9	0.21
500	4.76	4.8	0.84
1200	11.42	11.4	0.21
3600	34.27	34.3	0.08
5000	47.60	47.6	0.00

Note; Wind speed in knots = 0.00952 * shaft RPM

Wind direction signal: Passed

Maximum error = +/- 2 degrees
Test results:

Actual	Meaured	Error
0	359	-1
30	29	1
60	59	1
90	90	0
120	120	0
150	150	0
180	180	0
210	210	0
240	240	0
270	269	1
300	298	2
330	330	0

Barometer

Serial # BP01643

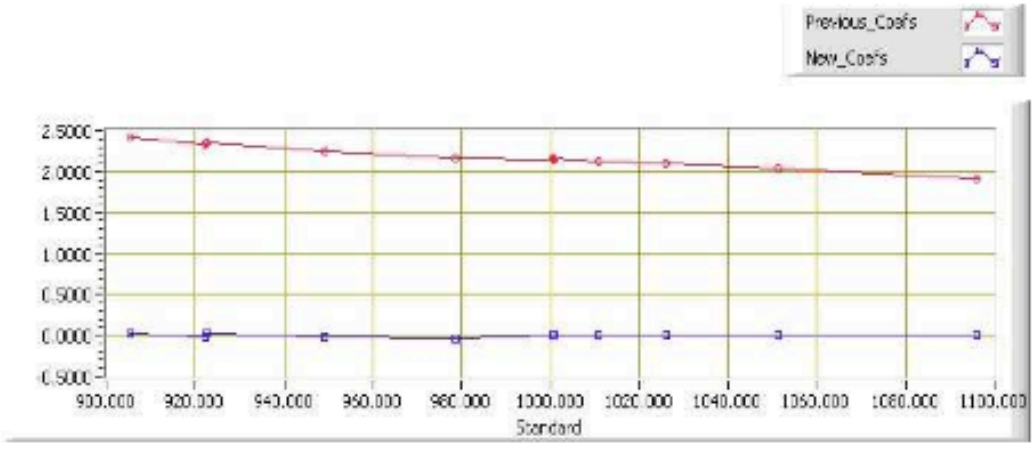
Baro Pres Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: BP01643
CALIBRATION DATE: 22-Feb-08
SENSOR ID: BPR80
Mfg: RM Young Model: 612011
Previous Cal Date: 01-Jan-00
Calibration Tech: CM
CALIBRATION AT 25.0 DegC

A= 5.98528E+1
B= 8.02635E+2

Calibration Standard: Mfg: Paroscientific Model: 765-16B s/n: 101778
Polynomial Order = 1
Xcalc = A*X+B

SENSOR VOLTS	STANDARD DATA	SENSOR New_Coefs	SPRT-INST Prev_Coefs	SPRT-INST New_Coefs
4.901	1095.960	1095.953	1.920	0.007
4.151	1051.090	1051.086	2.028	0.004
3.731	1025.970	1025.963	2.092	0.007
3.475	1010.640	1010.645	2.118	-0.005
3.306	1000.490	1000.479	2.159	0.011
3.314	1000.990	1000.986	2.151	0.004
2.939	978.480	978.517	2.165	-0.037
2.445	948.980	949.001	2.254	-0.021
2.004	922.570	922.555	2.355	0.015
1.998	922.190	922.205	2.326	-0.015
1.713	905.210	905.180	2.413	0.030



Air Temperture / Relative Humidity

Serial # 13352

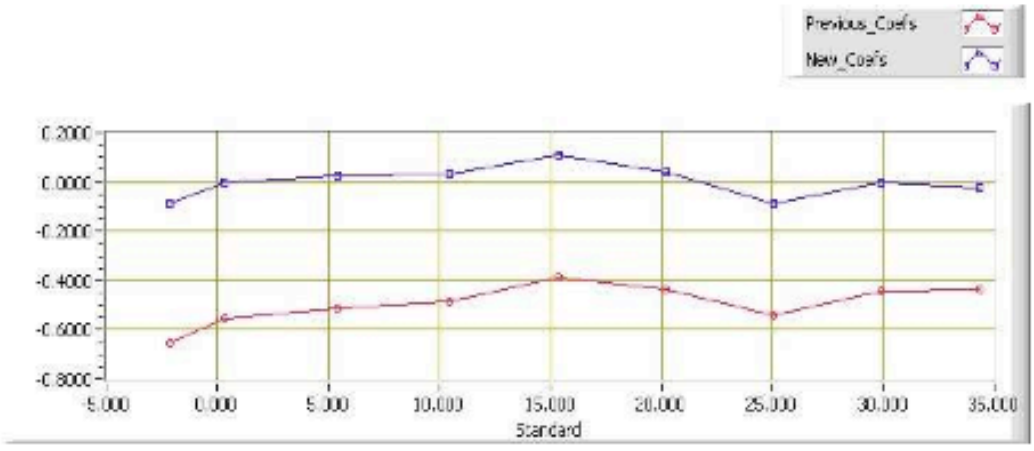
Air Temperature Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 13352
CALIBRATION DATE: 22-Feb-08
SENSOR ID: HRH17
Mfg: RM Young Model: 41382V
Previous Cal Date: 01-Jan-2000
Calibration Tech: CM

A= 1.01413E+2
B= -5.07642E+1

Calibration Standard: Mfg: Seabird Model: SBE35 s/n: 0006
Polynomial Order = 1
Xcalc = A*X+B

SENSOR	STANDARD DATA	SENSOR New_Coefs	SPRT-INST Prev_Coefs	SPRT-INST New_Coefs
0.480	-2.122	-2.035	-0.652	-0.087
0.504	0.337	0.338	-0.557	-0.001
0.554	5.421	5.398	-0.513	0.023
0.603	10.448	10.418	-0.485	0.030
0.651	15.345	15.235	-0.386	0.110
0.699	20.190	20.154	-0.439	0.036
0.748	25.029	25.113	-0.539	-0.084
0.796	29.914	29.920	-0.442	-0.006
0.840	34.361	34.382	-0.439	-0.021



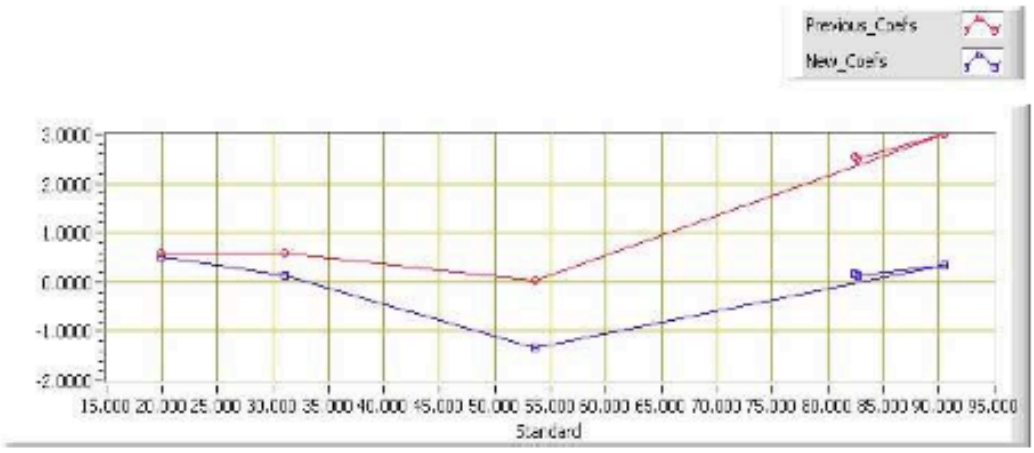
HUMIDITY Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 13352
CALIBRATION DATE: 24-Feb-08
SENSOR ID: HRH17
Mfg: RM Young Model: 41382V
Previous Cal Date: 01-Jan-2000
Calibration Tech: CM

A= 1.04836E+2
B= -6.79727E-1

Calibration Standard: Mfg: GE Sensing Model: Humilab s/n: 0240507
Polynomial Order = 1
Xcalc = A*X+B

SENSOR	STANDARD DATA	SENSOR New_Coefs	SPRT-INST Prev_Coefs	SPRT-INST New_Coefs
0.791	82.450	82.266	2.539	0.184
0.794	82.710	82.560	2.516	0.150
0.866	90.460	90.108	2.994	0.352
0.530	53.570	54.904	0.020	-1.334
0.301	31.000	30.876	0.599	0.124
0.192	19.920	19.396	0.579	0.524



PAR

Serial # 20270

Biospherical Instruments Inc.

CALIBRATION CERTIFICATE

Calibration Date	1/9/2007
Model Number	QSR-2200
Serial Number	20270
Operator	TPC
Standard Lamp	F-863
Probe Excitation Voltage Range:	6 to 18 VDC(+)
Output Polarity:	Positive

Probe Conditions at Calibration(in air):

Calibration Voltage:	6 VDC(+)
Probe Current:	4.0 mA

Probe Output Voltage:

Probe Illuminated	95.87 mV
Probe Dark	1.32 mV
Probe Net Response	94.55 mV

Corrected Lamp Output:

Output In Air (same condition as calibration):

9.43E+15 quanta/cm²sec

0.01566 uE/cm^{2}sec

Calibration Factor:

(To calculate irradiance, divide the net voltage reading in Volts by this value.)

Dry:	1.00E-17 V/(quanta/cm²sec)
	6.04E+00 V/(uE/cm^{2}sec)

Notes:

1. Annual calibration is recommended.
2. Calibration is performed using a Standard of Spectral Irradiance traceable to the National Institute of Standards and Technology (NIST).
3. The collector should be cleaned frequently with alcohol.
4. Calibration was performed with customer cable, when available.

QSR240R 05/24/95

Shortwave Radiation Pyranometer

Serial # 35032F3

THE EPPLEY LABORATORY, INC.
12 Sheffield Ave., P.O. Box 419, Newport, RI 02840 USA
Telephone: 401-847-1020 Fax: 401-847-1031
Email: info@eppleylab.com Internet: www.eppleylab.com

EPLAB
Scientific Instruments for Precision Measurements Since 1917

STANDARDIZATION OF EPPLEY PRECISION SPECTRAL PYRANOMETER Model PSP

Serial Number: 35032F3

Resistance: 724 Ω at 23 °C
Temperature Compensation Range: -20 to 40 °C

This radiometer has been compared with Standard Precision Spectral Pyranometer, Serial Number 21231F3 in Eppley's Integrating Hemisphere under radiation intensities of approximately 700 watts meter^{-2} (roughly one half a solar conatant).

As a result of a series of comparisons, it has been found to have a sensitivity of:

8.35 x 10^{-6} volts/watts meter^{-2}

The calculation of this constant is based on the fact that the relationship between radiation intensity and emf is rectilinear to intensities of 1400 watts meter^{-2}. This radiometer is linear to within ± 0.5% up to this intensity.

The calibration of this instrument is traceable to standard self-calibrating cavity pyrheliometers in terms of the Systems Internationale des Unites (SI units), which participated in the Tenth International Pyrheliometric Comparisons (IPC X) at Davos, Switzerland in September-October 2005.

Eppley recommends a minimum calibration cycle of five (5) years but encourages annual calibrations for highest measurement accuracy. Unless otherwise stated in the remarks section below or on the Sales Order, the results are "AS FOUND / AS LEFT".

Useful conversion facts: 1 cal cm^{-2} min^{-1} = 697.3 watts meter^{-2}
1 BTU/ft^2-hr^{-1} = 3.153 watts meter^{-2}

Shipped to:
UCSD/SIO
La Jolla, CA

Date of Test: July 5, 2007

In Charge of Test: R. T. Eppley

S.O. Number: 61245
Date: August 1, 2007

Reviewed by: Thomas D. Kirk

Remarks:

Longwave Radiation Pyrgeometer

Serial # 34955F3

THE EPPLEY LABORATORY, INC.
12 Sheffield Ave., P.O. Box 419, Newport, RI 02840 USA
Telephone: 401-847-1020 Fax: 401-847-1031
Email: info@eppleylab.com Internet: www.eppleylab.com

EPLAB
Scientific Instruments for Precision Measurements Since 1917

STANDARDIZATION OF EPPLEY PRECISION INFRARED RADIOMETER Model PIR

Serial Number: 34955F3

Resistance: 708 Ω at 23 °C
Temperature Compensation Range: -20 to 40 °C

This pyrgeometer has been compared against Eppley's Blackbody Calibration System under radiation intensities of approximately 200 watts meter^{-2} and an average ambient temperature of 25°C as measured by Standard Omega Temperature Probe, RTD#1.

As a result of a series of comparisons, it has been found to have a sensitivity of:

3.32 x 10^{-6} volts/watts meter^{-2}

The calculation of this constant is based on the fact that the relationship between radiation intensity and emf is rectilinear to intensities of 700 watts meter^{-2}. This radiometer is linear to within ±1.0% up to this intensity.

The calibration of this instrument is traceable to the International Practical Temperature Scale (IPTS) through a precision low-temperature blackbody.

Eppley recommends a minimum calibration cycle of five (5) years but encourages annual calibrations for highest measurement accuracy. Unless otherwise stated in the remarks section below or on the Sales Order, the results are "AS FOUND / AS LEFT".

Shipped to:
UCSD/SIO
La Jolla, CA

S.O. Number: 61272
Date: August 17, 2007

Date of Test: May 31, 2007

In Charge of Test: P.T. Eppley

Reviewed by: Thomas J. Kub

Remarks:

Jack Staff MET Station

Serial # 101757

Paroscientific, Inc.
Pressure Instrument Configuration

SN: 101757 Part Number: 1539-004 Model: MET3A Port:
Calibration Date: 27-Jun-07 Report No: 7238 Technician: WMR
Pressure Range: 500 to 1100 hPa Temperature Range: -50 to -60

Customer: Scripps Inst. of Oceanography Report Date: 27-Jun-07
Address : 8825 Biological Grade Sales Order: 24367
La Jolla, CA 92037 USA S/R Number :

Configuration

BL: 0	PT: N
BR: 9600	QD: -
DD: -	QO: -
DL: -	SL: -
DM: -	SN: 101757
DO: -	ST: -
DP: -	SU: -
ID: 01	TI: -
IM: -	TR: 00952
LL: -	TU: -
LH: -	UF: 1.000000
MC: Y	UL: -
MD: 0	UM: -
MN: -	UN: 3
OP: -	US: -
PP: -	VR: M1.02
PI: -	ZI: -
PL: -	ZS: -
PO: -	ZL: -
PR: 00238	ZV: -
PS: -	

Calibration Coefficients

U0:	5.766908	µsec
Y1:	-4015.975	deg C / µsec
Y2:	-17065.37	deg C / µsec²
Y3:	-140256.4	deg C / µsec³
C1:	94.87589	psi
C2:	3.545282	psi / µsec
C3:	-114.9551	psi / µsec²
D1:	0.0345157	
D2:	0.0000000	
T1:	28.00064	µsec
T2:	0.837535	µsec / µsec
T3:	16.78157	µsec / µsec²
T4:	-150.7085	µsec / µsec³
T5:	-129.729	µsec / µsec⁴
TC:	0.6782145	
PA:	0.0000000	
PM:	1.0000000	

Met3/3A Coefficients

B1:	-0.551136	B2:	0.84
F1:	-264.3591	F2:	3.152
G1:	12.56743	G2:	0.00216
H1:	RHT894	H2:	0.0036
K1:	01842	K2:	0.00511
M1:	1	M2:	1
Z1:	0	Z2:	0

Paroscientific, Inc.
4500 148th Ave. N.E. Redmond, WA 98052
Phone: (425)883-8700 Fax: (425)867-5407
Web:http://www.paroscientific.com
Email: support@paroscientific.com

Prepared by

PARO TEST 17

Digiquartz® Technology

Page 1 of 1

Underway Ocean Flow through Sensors

Seabird ThermoSalinograph

Serial # 0215

Temperature

SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0215
CALIBRATION DATE: 01-Aug-07

SBE 45 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

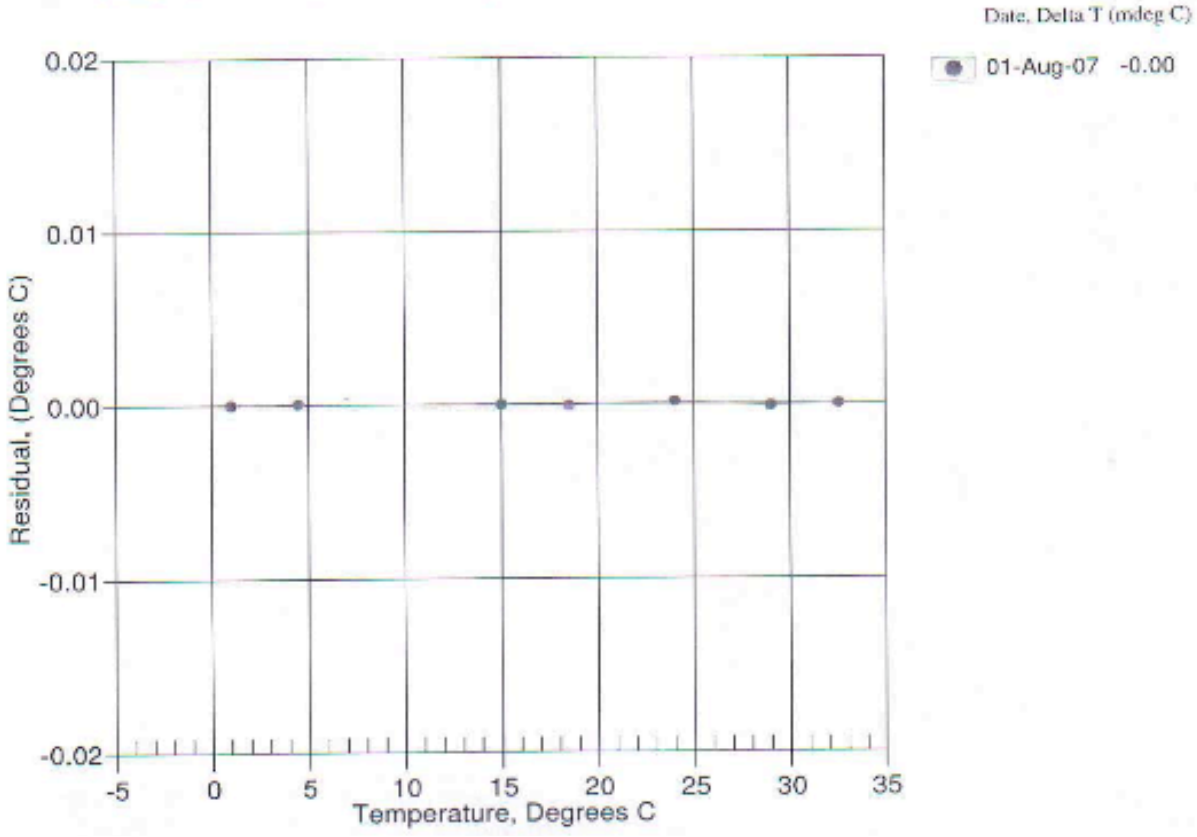
ITS-90 COEFFICIENTS

a0 = -1.277283e-006
a1 = 2.800988e-004
a2 = -2.767325e-006
a3 = 1.635307e-007

BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	657810.8	0.9999	-0.0001
4.5000	562392.5	4.5000	0.0000
15.0000	358324.1	14.9999	-0.0001
18.5001	310251.4	18.5000	-0.0001
24.0000	248855.2	24.0001	0.0002
29.0001	204884.7	29.0000	-0.0001
32.4999	179404.2	32.5000	0.0000

Temperature ITS-90 = $1/\{a0 + a1[ln(n)] + a2[ln^2(n)] + a3[ln^3(n)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



Conductivity

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0215
CALIBRATION DATE: 01-Aug-07

SBE 45 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g =	-9.817728e-001	CPcor =	-9.5700e-008
h =	1.408372e-001	CTcor =	3.2500e-006
i =	-1.671624e-004	WBOTC =	2.4202e-005
j =	3.431539e-005		

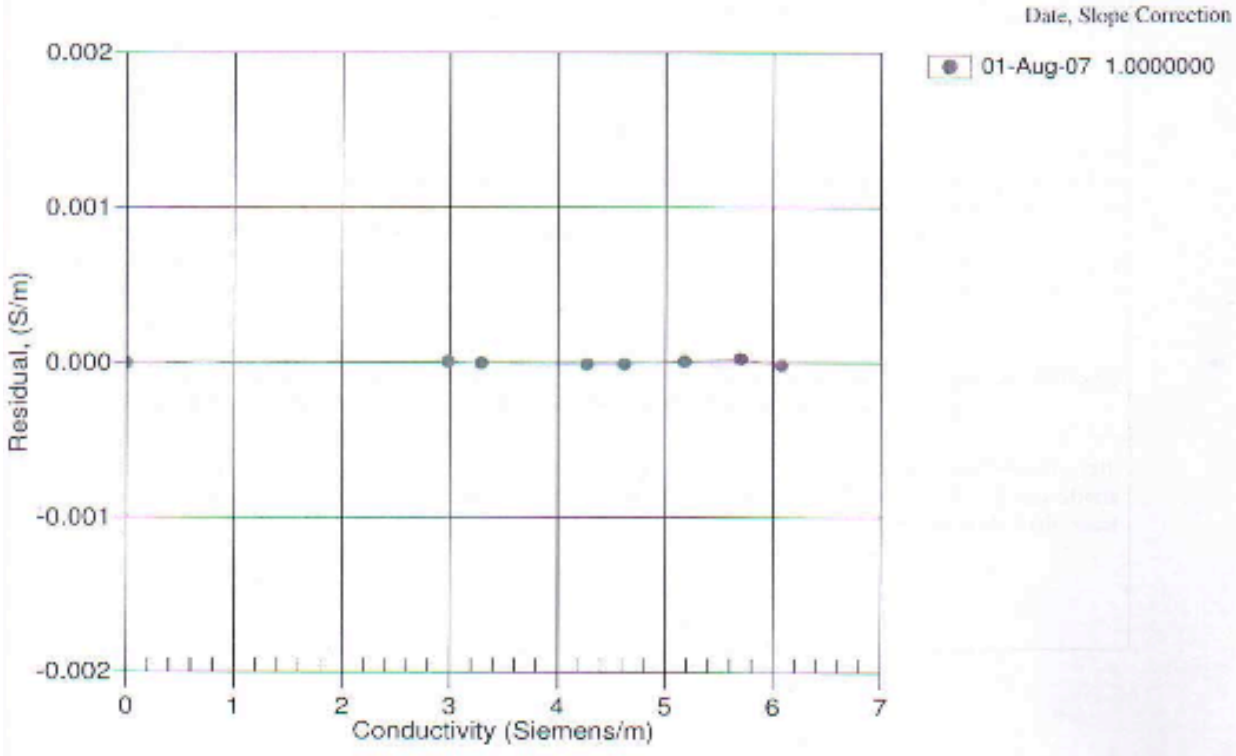
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2641.45	0.00000	0.00000
1.0000	34.8934	2.98132	5303.53	2.98193	0.00061
4.5000	34.8731	3.28955	5504.48	3.28955	-0.00000
15.0000	34.8297	4.27308	6101.73	4.27307	-0.00001
18.5001	34.8207	4.61830	6297.94	4.61889	0.00061
24.0000	34.8111	5.17793	6602.44	5.17794	0.00001
29.0001	34.8062	5.70086	6874.67	5.70088	0.00002
32.4999	34.8046	6.07417	7062.34	6.07415	-0.00002

f = INST FREQ * sqrt(1.0 + WBOTC * t) / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



Remote Sea Temperature (Sea Chest)

Serial # 4063

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 4063
CALIBRATION DATE: 13-Dec-07

SBE3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.29921671e-003
h = 6.36406488e-004
i = 2.06912541e-005
j = 1.52019386e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.68121265e-003
b = 5.99688417e-004
c = 1.61521904e-005
d = 1.52164480e-006
f0 = 2721.791

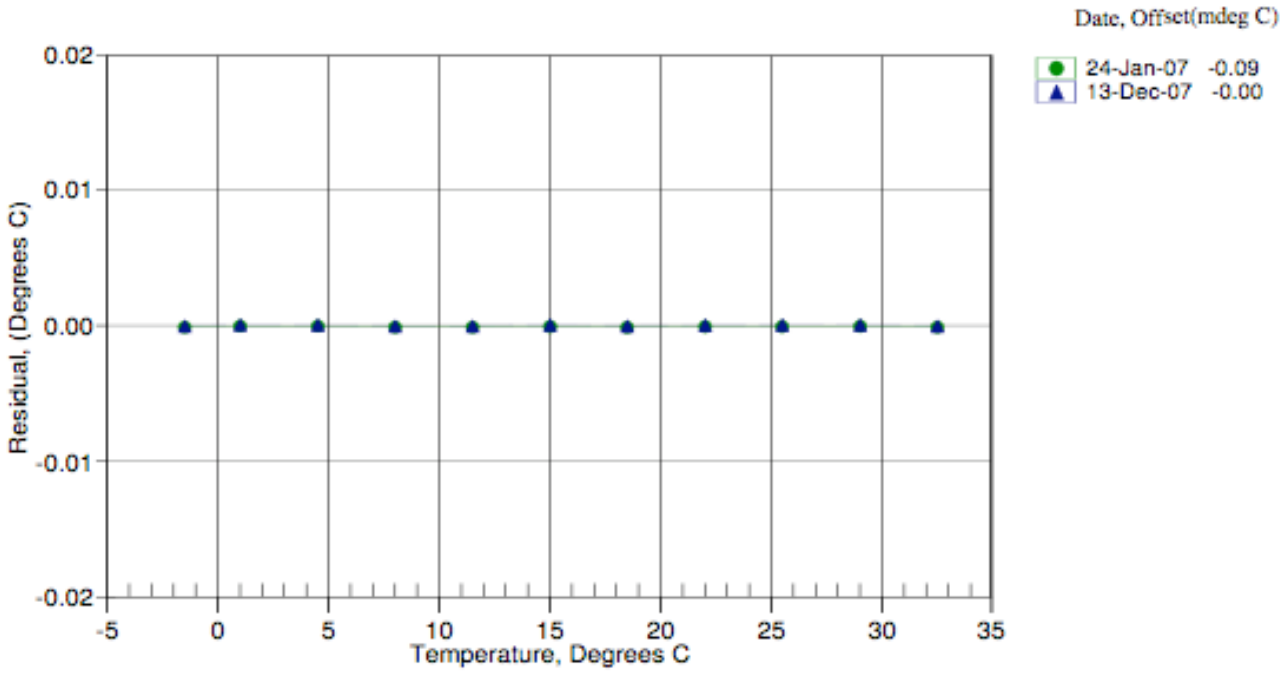
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
-1.5000	2721.791	-1.5000	-0.00002
1.0000	2878.781	1.0000	0.00003
4.5000	3109.455	4.5000	0.00002
8.0000	3353.176	8.0000	-0.00001
11.5000	3610.316	11.5000	-0.00001
15.0000	3881.236	15.0000	0.00002
18.5000	4166.278	18.5000	-0.00004
22.0000	4465.803	22.0000	0.00000
25.5000	4780.134	25.5000	0.00003
29.0000	5109.596	29.0000	0.00002
32.5000	5454.501	32.5000	-0.00002

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature IPTS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

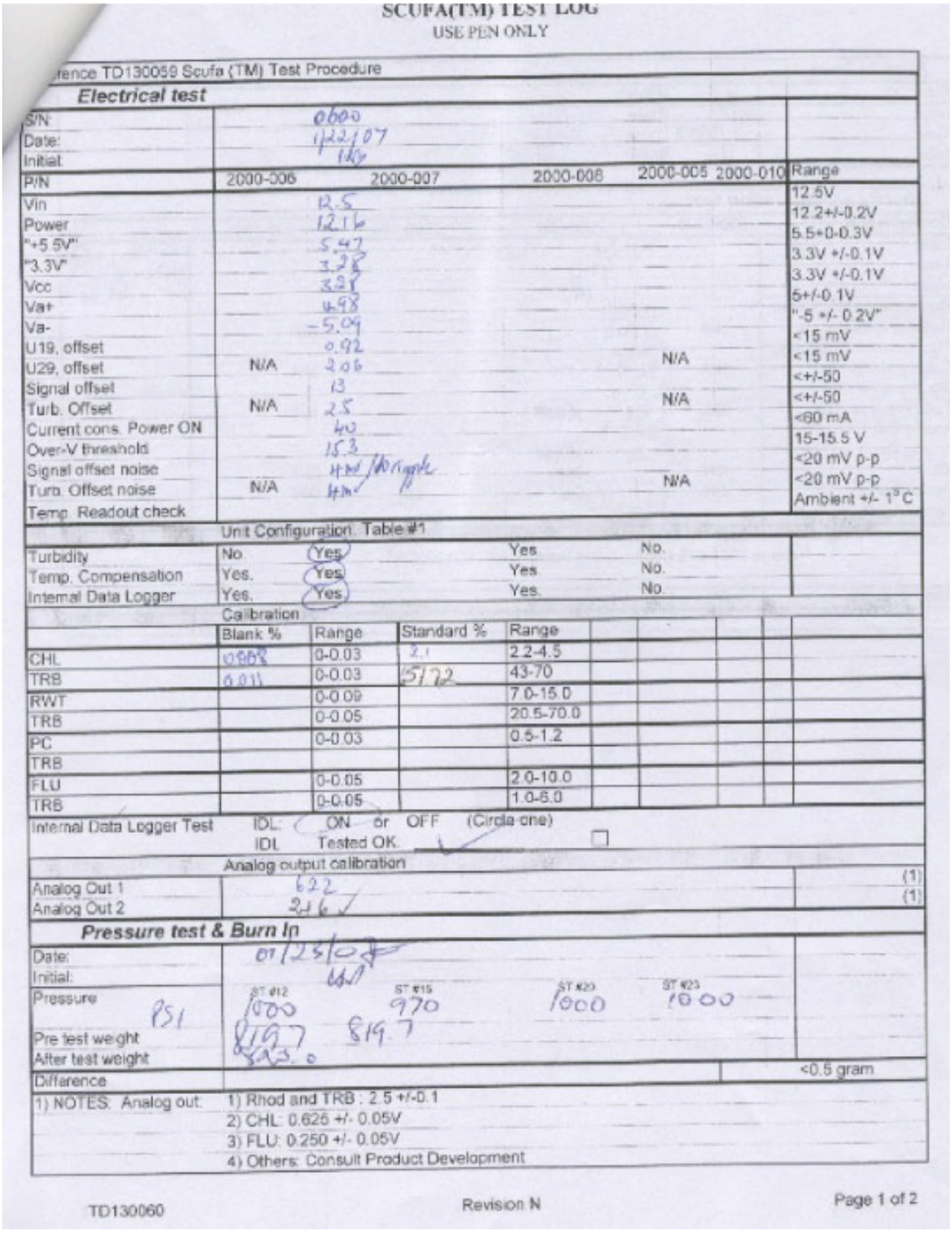
Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



Fluorometer B

Serial # 0600



SCUFA(TM) TEST LOG
USE PEN ONLY

rence TD130059 Scufa (TM) Test Procedure

Electrical test

S/N:	0600					
Date:	1/22/07					
Initial:	HG					
P/N	2000-006	2000-007	2000-008	2000-005	2000-010	Range
Vin	12.5					12.5V
Power	12.16					12.2+/-0.2V
"+5.5V"	5.47					5.5+0-0.3V
"3.3V"	3.28					3.3V +/-0.1V
Vcc	3.28					3.3V +/-0.1V
Va+	4.98					5+/-0.1V
Va-	-5.09					"-5 +/- 0.2V"
U19, offset	0.92					<15 mV
U29, offset	N/A	2.06		N/A		<15 mV
Signal offset		13				<+/-50
Turb. Offset	N/A	2.5		N/A		<+/-50
Current cons. Power ON		40				<60 mA
Over-V threshold		15.3				15-15.5 V
Signal offset noise		4mV /10 ripple				<20 mV p-p
Turb. Offset noise	N/A	4mV		N/A		<20 mV p-p
Temp. Readout check						Ambient +/- 1°C

Unit Configuration: Table #1

Turbidity	No	(Yes)		Yes		No.				
Temp. Compensation	Yes.	(Yes)		Yes		No.				
Internal Data Logger	Yes.	(Yes)		Yes.		No.				

Calibration

	Blank %	Range	Standard %	Range					
CHL	0.008	0-0.03	2.1	2.2-4.5					
TRB	0.011	0-0.03	51.2	43-70					
RWT		0-0.09		7.0-15.0					
TRB		0-0.05		20.5-70.0					
PC		0-0.03		0.5-1.2					
TRB									
FLU		0-0.05		2.0-10.0					
TRB		0-0.05		1.0-6.0					

Internal Data Logger Test — IDL: (ON) or OFF (Circle one)
IDL Tested OK: ✓ ☐

Analog output calibration

Analog Out 1	622	(1)
Analog Out 2	2.16 ✓	(1)

Pressure test & Burn In

Date:	01/25/07				
Initial:	HG				
Pressure PSI	ST #12: 1000	ST #15: 970	ST #20: 1000	ST #23: 1000	
Pre test weight	819.7	819.7			
After test weight	825.0				
Difference					<0.5 gram

1) NOTES: Analog out:
1) Rhod and TRB : 2.5 +/-0.1
2) CHL: 0.625 +/- 0.05V
3) FLU: 0.250 +/- 0.05V
4) Others: Consult Product Development

TD130060 Revision N Page 1 of 2

SCUFA(TM) TEST LOG

USE PEN ONLY

Burn In Test			
Start		Finish	
Date:	01/23	Date:	01/24
Time:	1000	Time:	9:00
Initial:	MS	Initial:	MS

Check / configuration test					
Configuration	2000-006	2000-007	2000-008	2000-005 2000-010	
Date:		01/24			Ref'd Turb. BLK = 0.013 Tur = 48.92
Time:		9:00			
Initial:		MS			
Fluorescence (Black Rod)		0.021			
Turbidity (Black Rod)	N/A	0.000		N/A	
Fluorescence (Solid Std)		(10.00)			
Tubidity (Solid Std)	N/A	(92.91) 100		N/A	
Sig. Pre-amp. Out		(-5.7)			<+/-50
Turb. Pre-amp. Out	N/A	(5)		N/A	<+/-50
Analog Out 1		(622)			(1)
Analog Out 2		(2.24) 2246			(1)
IDL	ON	ON	ON	OFF	
Temp. Comp.	ON	ON	ON	OFF	
Temp. Readout check		23.7°C			Ambient +/- 1°C BSL

FINAL INSTRUMENT CONFIGURATION (FOR CUSTOM ORDERS ONLY)

Refer to 2000-010 Configuration Instructions (TD130063)

Shop Order #:	IDL	Temp Comp	Turbidity	Date:
2000-010	ON	ON	ON	Initial(1): Initial (2):

SCUFA TEST STATUS

INIT. MB

1. S/N 0600 MODEL # 2000-007 S/O # 5357
2. S/N _____ MODEL # _____ S/O # _____
3. S/N _____ MODEL # _____ S/O # _____
4. S/N _____ MODEL # _____ S/O # _____
5. S/N _____ MODEL # _____ S/O # _____

BURN-IN:
DATE IN 01/23/07 TIME 10:00
DATE OUT 01/24/07 TIME 9:00

WEIGHT: ☑ (TEST LOG)

POST BURN-IN: ☐ (TEST LOG)

LABEL: ☐

BOX: ☐ 819.7

COMMENTS: _____

TD130060

TD130117
Rev. A

Page 3 of 2

CTD Sensors

Pressure Sensor

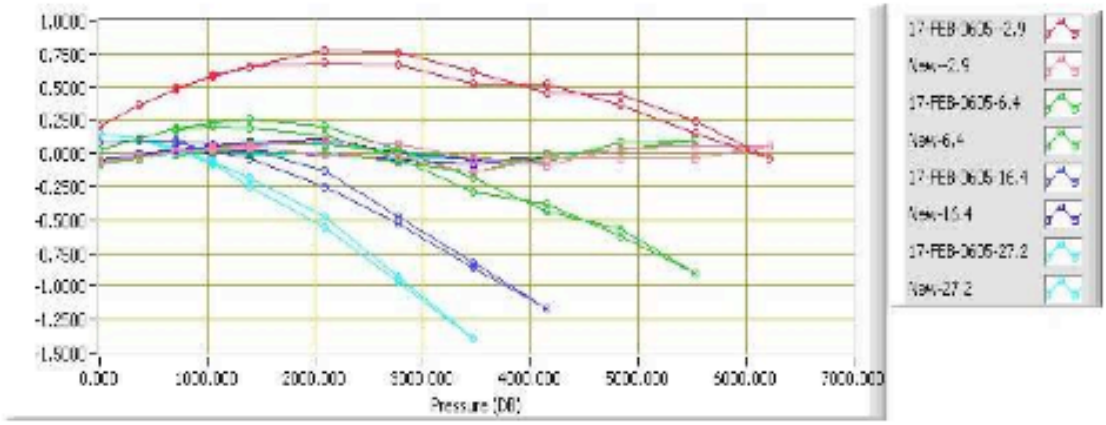
Serial # 83012

Pressure Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 639
CALIBRATION DATE: 18-JAN-2008
Mfg: Seabird Model: SBE9P CTD Prs s/n: 83012

C1= -3.841449E+4
C2= 4.630485E-1
C3= 1.014581E-2
D1= 3.051116E-2
D2= 0.000000E+0
T1= 3.019016E+1
T2= -1.746821E-4
T3= 4.517296E-6
T4= -9.087207E-9
T5= 0.000000E+0
AD590M= 1.27551E-2
AD590B= -9.09133E+0
Slope = 1.0
Offset = 0.0

Calibration Standard: Mfg: Ruska Model: 2400 s/n: 34336
t0=t1+t2*td+t3*td*td+t4*td*td*td
w = 1-t0*t0*f*f
Pressure = (0.6894759*((c1+c2*td+c3*td*td)*w*(1-(d1+d2*td)*w)-14.7)



Temperature #1

Serial # 2855

Temperature Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 2855
CALIBRATION DATE: 21-JAN-2008
Mfg: Seabird Model: SBE3Plus
Previous Cal Date: 24-Jan-07
Calibration Tech: CM

g= 4.35951439E-3
h= 6.45648951E-4
i= 2.38075037E-5
j= 2.35385504E-6
f0 = 1000.0
Slope = 1.0
Offset = 0.0

Calibration Standard: Mfg: ASL Model: F18 s/n: 245-5149
Temperature ITS-90 = 1/{g+h[ln(f0/f)]+i[ln2(f0/f)]+j[ln3(f0/f)]} - 273.15 (°C)

SBE3 Freq	SPRT	SBE3 New_Coefs	SPRT-SBE3 Prev_Coefs	SPRT-SBE3 New_Coefs
5479.6760	28.1875	28.1875	0.00140	0.00002
5798.0010	31.2142	31.2142	0.00189	-0.00002
5174.8630	25.1737	25.1737	0.00101	0.00002
4839.0220	21.7073	21.7073	0.00066	-0.00000
4563.9390	18.7410	18.7410	0.00045	-0.00003
4313.5900	15.9306	15.9306	0.00036	-0.00000
4062.6960	12.9964	12.9964	0.00029	0.00002
3819.2680	10.0242	10.0242	0.00019	-0.00001
3580.6660	6.9771	6.9771	0.00011	-0.00001
3359.2520	4.0167	4.0167	0.00007	0.00004
3216.0510	2.0264	2.0264	-0.00010	-0.00004
3143.3570	0.9916	0.9916	-0.00010	0.00002
3042.0950	-0.4792	-0.4792	-0.00018	0.00003
3003.6410	-1.0471	-1.0471	-0.00029	-0.00003
2934.0140	-2.0888	-2.0888	-0.00036	-0.00001

Temperature #2

Serial # 2796

Temperature Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 2796
CALIBRATION DATE: 21-JAN-2008
Mfg: Seabird Model: SBE3Plus
Previous Cal Date: 27-Jan-07
Calibration Tech: CM

g= 4.30545772E-3
h= 6.41541965E-4
i= 2.26535491E-5
j= 2.15838215E-6
f0 = 1000.0
Slope = 1.0
Offset = 0.0

Calibration Standard: Mfg: ASL Model: F18 s/n: 245-5149
Temperature ITS-90 = 1/{g+h[ln(f0/f)]+i[ln2(f0/f)]+j[ln3(f0/f)]} - 273.15 (°C)

SBE3 Freq	SPRT	SBE3 New_Coefs	SPRT-SBE3 Prev_Coefs	SPRT-SBE3 New_Coefs
5034.9080	28.1869	28.1869	0.00129	-0.00001
5327.3120	31.2134	31.2134	0.00145	0.00001
4754.9570	25.1736	25.1736	0.00117	-0.00003
4446.4900	21.7075	21.7075	0.00113	0.00003
4193.8400	18.7414	18.7414	0.00105	0.00000
3963.9100	15.9311	15.9311	0.00097	-0.00004
3733.4680	12.9969	12.9969	0.00098	0.00001
3509.8970	10.0249	10.0248	0.00098	0.00005
3290.7460	6.9777	6.9777	0.00087	-0.00002
3087.3980	4.0175	4.0175	0.00082	-0.00001
2955.8690	2.0273	2.0273	0.00077	-0.00001
2889.1220	0.9928	0.9928	0.00074	-0.00001
2796.0920	-0.4783	-0.4783	0.00068	-0.00002
2760.7580	-1.0463	-1.0463	0.00070	0.00001
2696.7970	-2.0881	-2.0881	0.00067	0.00003

Conductivity #1

Serial # 2619

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2619
CALIBRATION DATE: 14-Dec-07

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

```
g = -1.00741707e+001
h =  1.37979635e+000
i = -2.57491131e-004
j =  9.90906263e-005
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a =  6.03443989e-005
b =  1.37916951e+000
c = -1.00729173e+001
d = -8.34718673e-005
m =  4.1
CPcor = -9.5700e-008 (nominal)
```

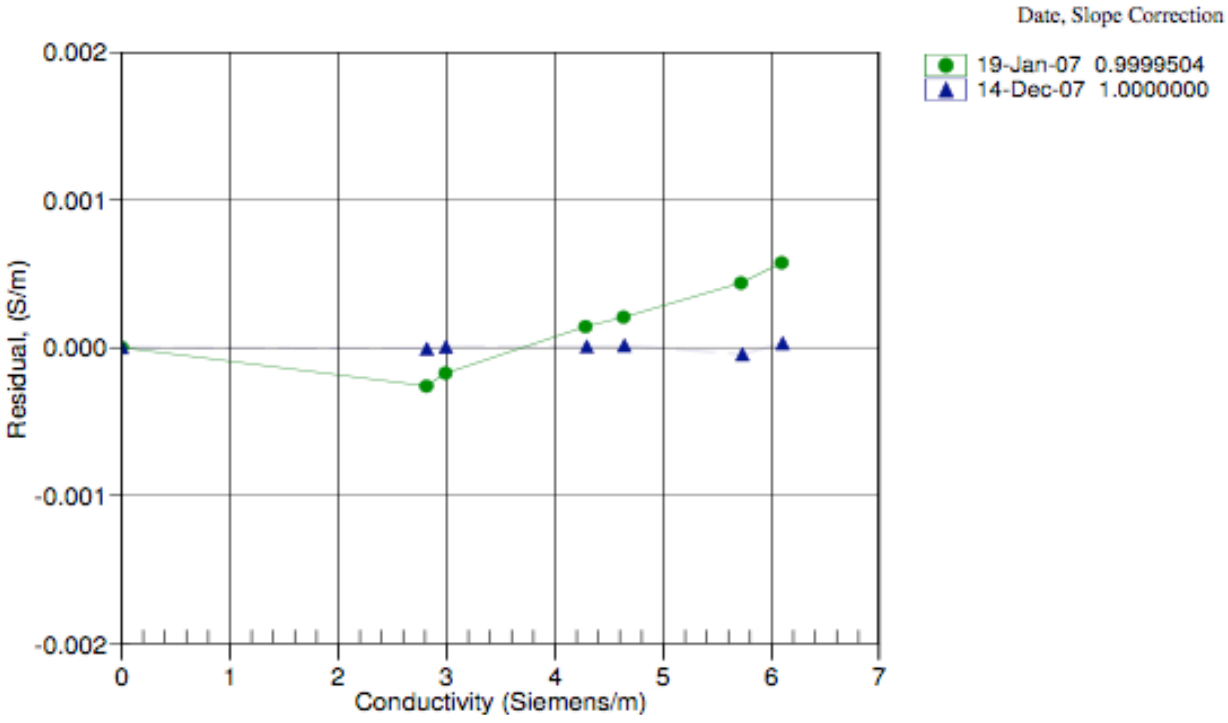
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.70205	0.00000	0.00000
-1.0000	34.9912	2.81735	5.26230	2.81734	-0.00001
1.0000	34.9914	2.98950	5.37926	2.98950	0.00000
15.0000	34.9917	4.29084	6.19186	4.29085	0.00001
18.5000	34.9910	4.63903	6.39166	4.63905	0.00001
29.0001	34.9873	5.72717	6.97891	5.72713	-0.00005
32.5001	34.9789	6.10114	7.16957	6.10117	0.00003

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



Conductivity # 2

Serial # 2545

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2545
CALIBRATION DATE: 14-Dec-07

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

```
g = -1.06684896e+001
h =  1.63895801e+000
i = -3.57219293e-004
j =  1.35481442e-004
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a =  6.45257403e-005
b =  1.63830537e+000
c = -1.06677871e+001
d = -8.65358367e-005
m =  4.2
CPcor = -9.5700e-008 (nominal)
```

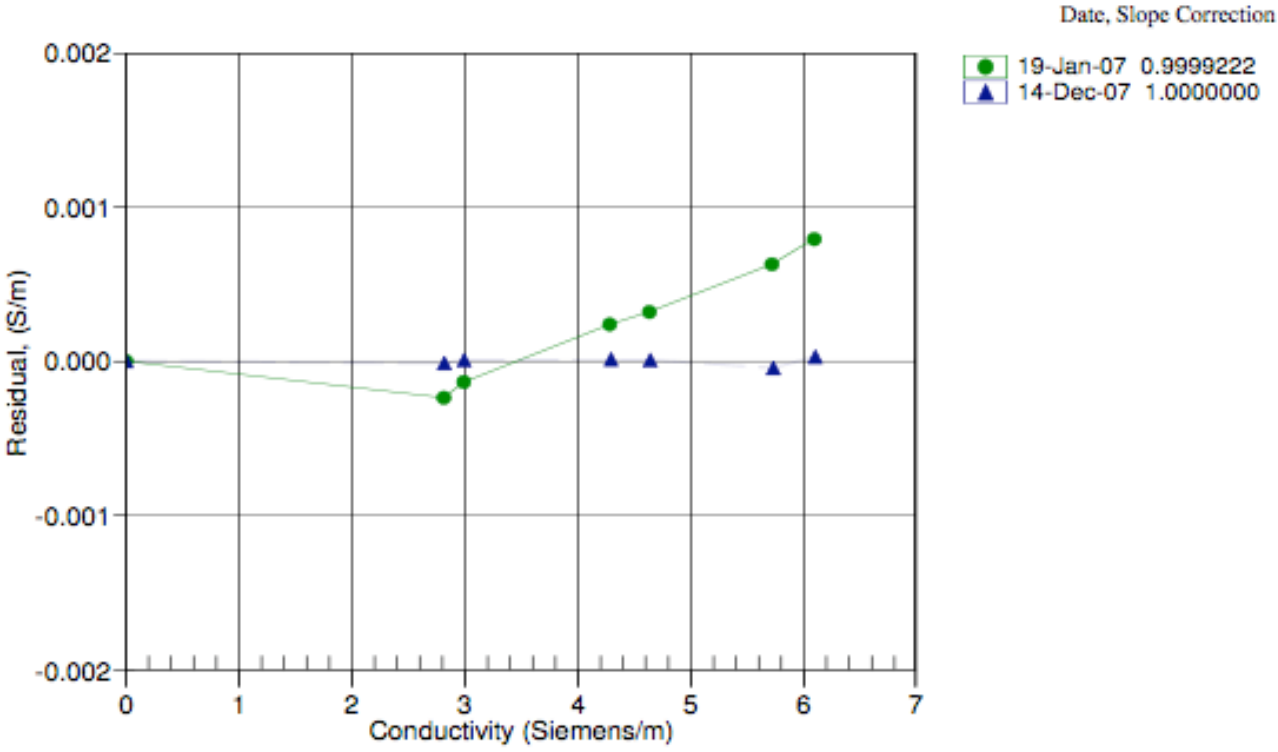
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREO (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.55136	0.00000	0.00000
-1.0000	34.9912	2.81735	4.86598	2.81733	-0.00001
1.0000	34.9914	2.98950	4.97252	2.98951	0.00001
15.0000	34.9917	4.29084	5.71345	4.29086	0.00001
18.5000	34.9910	4.63903	5.89581	4.63904	0.00001
29.0001	34.9873	5.72717	6.43217	5.72713	-0.00004
32.5001	34.9789	6.10114	6.60640	6.10117	0.00003

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



Oxygen

Serial # 0459

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0459
CALIBRATION DATE: 12-Dec-07p

SBE 43 OXYGEN CALIBRATION DATA

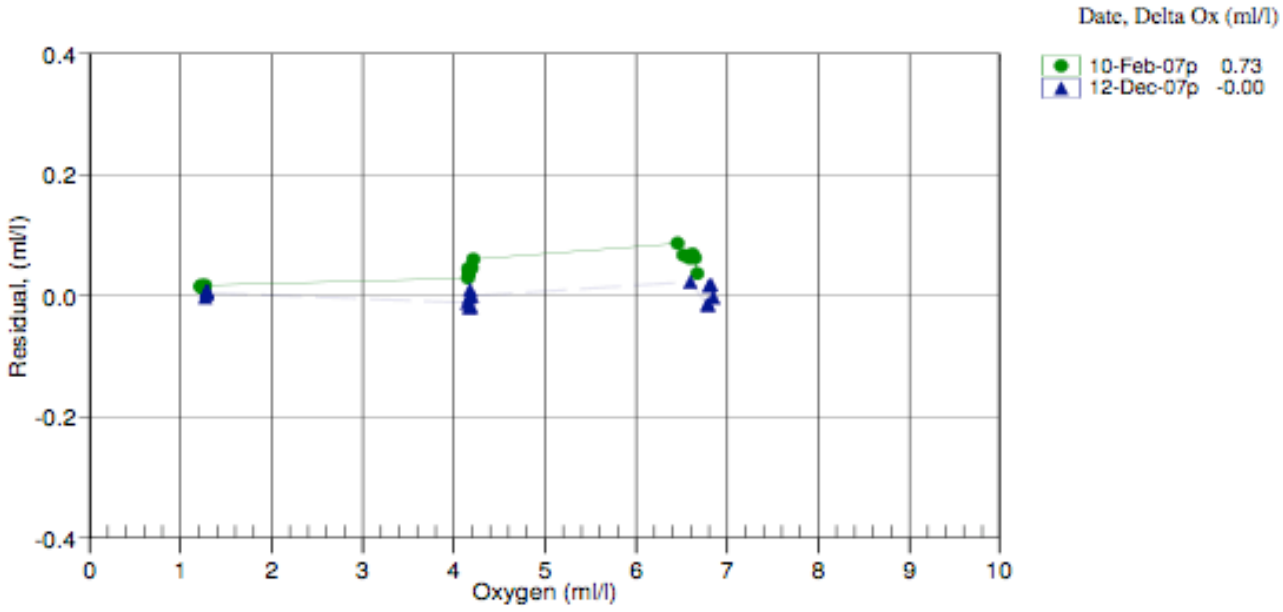
COEFFICIENTS

Soc = 0.4158
Boc = 0.0000
Voffset = -0.4827

TCor = 0.0011
PCor = 1.350e-04

BATH OX (ml/l)	BATH TEMP ITS-90	BATH SAL PSU	INSTRUMENT OUTPUT(VOLTS)	INSTRUMENT OXYGEN(ml/l)	RESIDUAL (ml/l)
1.27	20.00	0.01	0.953	1.27	-0.00
1.28	26.00	0.01	1.009	1.28	-0.00
1.28	12.00	0.01	0.887	1.28	0.00
1.28	2.00	0.00	0.802	1.29	0.01
1.29	6.00	0.00	0.838	1.30	0.01
1.29	30.00	0.01	1.053	1.29	0.00
4.15	26.00	0.01	2.187	4.13	-0.01
4.16	20.00	0.01	2.017	4.15	-0.02
4.17	12.00	0.01	1.795	4.17	-0.00
4.18	30.00	0.01	2.328	4.19	0.01
4.19	2.00	0.00	1.518	4.17	-0.02
4.19	6.00	0.00	1.634	4.19	-0.00
6.59	30.00	0.01	3.398	6.62	0.02
6.78	20.00	0.01	2.986	6.76	-0.01
6.79	26.00	0.01	3.277	6.78	-0.02
6.80	12.00	0.01	2.630	6.82	0.02
6.82	6.00	0.00	2.359	6.84	0.02
6.84	2.00	0.00	2.181	6.84	-0.00

oxygen (ml/l) = (Soc * (V + Voffset)) * exp(Tcor * T) * Oxsat(T,S) * exp(Pcor * P)
V = voltage output from SBE43, T = temperature [deg C], S = salinity [PSU]
Oxsat(T,S) = oxygen saturation [ml/l], P = pressure [dbar], Residual = instrument oxygen - bath oxygen



Flurometer

Serial # 088234

CERTIFICATE OF CALIBRATION

All test equipment and standards used are of known accuracy and are traceable to national standards. Details of test equipment and standards relevant to this certificate are available upon request.

Chelsea Technologies Group

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West Molesey
Surrey KT8 2QZ
United Kingdom
Tel: +44 (0)20 8481 9000
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sales@chelsea.co.uk
www.chelsea.co.uk

Date of issue	06 March 2007
Description	Mk III Aquatracka (Chlorophyll-a)
Serial Number	088234
Part No	3598C

REPORT

The fluorimeter was exposed to various concentrations of Chlorophyll-a dissolved in acetone in addition to pure water and pure acetone. The following formula was derived from the readings to relate instrument output to chlorophyll-a concentration.

$$\text{Conc.} = (0.00779 \times 10^{\text{Output}}) - 0.0211$$

Where:-

Conc. = fluorophor concentration in µg/l
Output = Aquatracka output in volts

The above formula can be used in the range 0 - 100 microgrammes per litre to an uncertainty of 0.02 microgrammes per litre plus 5% of value.

Notes

The above formula has been derived using Chlorophyll-a dissolved in acetone. No guarantee is given as to the performance of the instrument to biologically active chlorophyll in sea-water.

The zero offset has been determined in the laboratory using purified water from a reverse osmosis/ion exchange column. It is possible that purer water may be found in clean deep ocean conditions. Under these conditions, the offset shown in the above formula should be replaced by the antilogarithm of the Aquatracka output in the purest water found, multiplied by the scale factor.

Transmisometer

Serial # CST-390DR

PO Box 518
620 Applegate St.
Philomath, OR 97370

(541) 929-565
Fax (541) 929-527
www.wetlabs.co

WET Labs

C-Star Calibration

Date February 27, 2007 Customer US Coast Guard Work order 004

Job # 0012004 S/N# CST-390DR Pathlength 25 cm

	Analog meter
V_d	0.058 V
V_{air}	4.788 V
V_{ref}	4.707 V

Temperature of calibration water	18.8 °C
Ambient temperature during calibration	23.4 °C

Relationship of transmittance (Tr) to beam attenuation coefficient (c), and pathlength (x): $Tr = e^{-cx}$

To determine beam transmittance: $Tr = (V_{sig} - V_{dark}) / (V_{ref} - V_{dark})$

To determine beam attenuation coefficient: $c = -1/x * \ln(Tr)$

V_d Meter output with the beam blocked. This is the offset.
V_{air} Meter output in air with a clear beam path.
V_{ref} Meter output with clean water in the path.
Temperature of calibration water: temperature of clean water used to obtain V_{ref}.
Ambient temperature: meter temperature in air during the calibration.
V_{sig} Measured signal output of meter.

cstarwkbkf1.xls Revision F 1/17/05

PAR

Serial # 70115

Calibration Date:	01/09/07			Job No.:	L9511
Model Number:	QSP2300				
Serial Number:	70115				
Operator:	TPC				
Standard Lamp:	F-863(9/30/05)				
Operating Voltage Range:	6	to	15	VDC (+)	

Note: The QSP-2300 output is a voltage that is proportional to the log of the incident irradiance.
To calculate irradiance, use this formula:

Irradiance = Calibration factor * (10^Light Signal Voltage - 10^Dark Voltage)

Dry Calibration Factor:	**3.22E+12**	**quanta/cm²·sec per volt**	**5.34E-06**	**µEinsteins/cm²·sec per volt**
Wet Calibration Factor:	**5.42E+12**	**quanta/cm²·sec per volt**	**9.00E-06**	**µEinsteins/cm²·sec per volt**

Sensor Test Data and Results [2)]

Sensor Supply Current (Dark):	3.5	mA		
Supply Voltage:	6	Volts		
Lamp Integrated PAR Irradiance:	9.43E+15	quanta/cm²·sec	0.01566	µEinsteins/cm²sec
SC3 Immersion Coefficient:	0.594			

Nominal Filter OD	Expected Transmission	Calibrated Trans.	Sensor Voltage	Expected Voltage	Voltage % Error	Measured Trans.	Transmission Error (%)	Test Irrad. (quanta/ cm²·sec)
No Filter	100%	100.00%	3.467	3.467	0%	100.00%	0.0	9.43E+15
0.3	50%	36.10%	3.007	3.024	-1%	34.66%	4.2	3.27E+15
0.5	32%	27.60%	2.897	2.908	0%	26.87%	2.7	2.54E+15
1	10%	9.27%	2.478	2.434	2%	10.22%	-9.3	9.66E+14
2	1%	1.11%	1.608	1.512	6%	1.35%	-17.7	1.30E+14
3	0.10%	0.05%	0.500	0.194	61%	0.07%	-27.4	1.02E+13

Dark Before:	0.003	Volts
Light - No Filter Hldr.:	3.467	Volts
Dark After - NFH:	0.003	Volts
Average Dark	0.00274	Volts

Notes:

1. Annual calibration is recommended.

2) This section is for internal use and for more advanced analysis.

Instrument Locations on the Healy

Layout plot of instrument locations

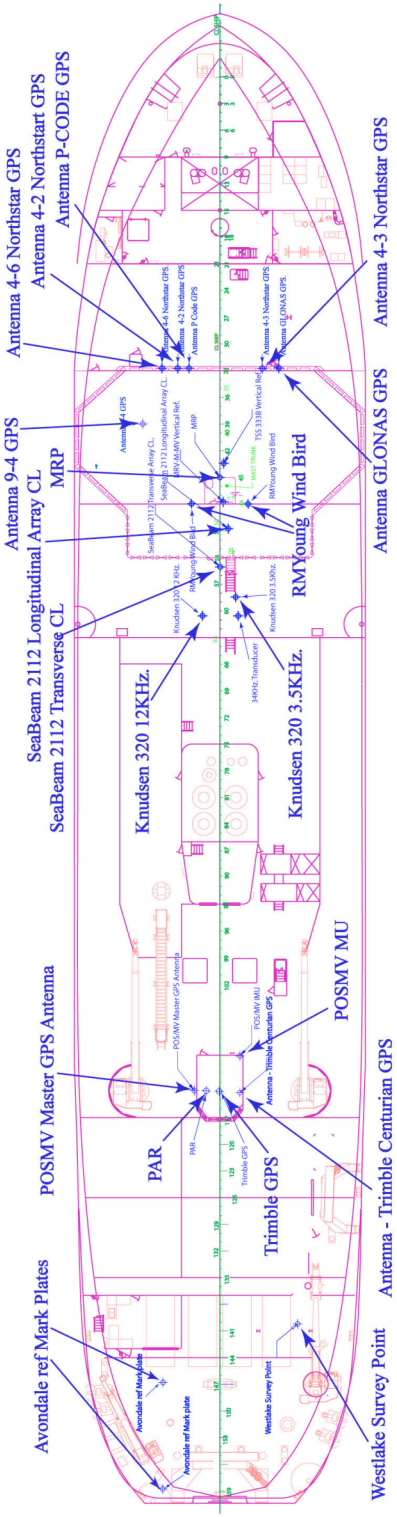

Table of Survey measurements

Consolidated Survey Data						
	Elements of:					
		Avondale Survey				
		Westlake Survey				
		Lamont Survey				
	All Measurements in *Meters* relative to MRP unless otherwise stated					
	X = fore & aft with + foreward					
	Y = port & starboard with + to starboard					
	Z= vertical with + upwards					
				X	Y	Z
Item	***Survey***	***Description***		***North***	***East***	***Elevation***
1	Avondale	**MRP**	See discussion Westlake Final Report	34.30	0.00	9.15
2	Westlake	**MRP**	by Definition	0.00	0.00	0.00
3	Westlake	**Seabeam 2112**				
		Transverse Array	Centerline	-7.679	0.030	9.242
		Longitudinal Array	Centerline	-4.386	0.711	9.238
4	Westlake	**Transducers**				
		Starboard - Forward to Aft				
		Transducer -	Bathy 2000 3.5 kHz	-10.252	1.362	9.243
		Transducer -	Bathy 1500 34 kHz *	-11.866	1.559	9.245
		Transducer -	Doppler Speed Log	-12.168	0.414	9.245
		Transducer -	Spare Transducer Well	-13.081	1.449	9.237
5	Westlake	**Port - Forward to Aft**				

		Transducer -	VM 150	-9.726	-1.395	9.230
		Transducer -	Ocean Surveyor 75 kHz	-10.819	-1.290	9.230
		Transducer -	Bathy 2000 12 kHz	-11.859	-1.492	9.234
		Transducer -	Spare Transducer Well	-13.078	-1.394	9.235
6	Westlake	Gyros				
		Starboard Gyro	Centerline	4.741	0.207	-19.604
		Port Gyro	Centerline	4.746	-0.207	-19.609
7	Westlake	**Antennas**				
		REF DWG TBD	Antenna 9-4 * - GPS Antenna (4.1.5)	4.587	-6.622	-24.000
			Antenna 4-6 * - Northstar GPS (4.1.1)	9.374	-4.970	-23.406
			Antenna 4-2 * - Northstar (4.1.2)	9.362	-3.617	-23.451
			P CODE GPS Antenna *	9.368	-2.645	-23.609
			Antenna 4-3 * - Northstar (4.1.4)	9.355	3.638	-23.363
			GLONAS GPS Antenna *	9.379	5.066	-23.515
			Antenna base (4A)	-53.872	-0.011	-22.025
			Antenna base (4B)	-49.758	0.038	-22.010
			Antenna base (4C)	-49.785	1.629	-22.020
			Antenna base (4D)	-49.771	-1.546	-22.008
			Trimble Centurion**	-52.726	-1.717	-21.113
			Time Server **	-52.671	1.838	-21.115
8	Westlake	**Vertical Ref**				
			MRV-M-MV -			
			Measured at Top of mounting bracket			

			Center (mid-point) - calculated	-2.100	0.291	-0.775
			TSS 333B - Marine Motion Sensor -			
			scribe atop mounting plate			
			Center of TSS 333B	1.210	0.329	-0.013
9	LDEO	**POS/MV**				
		From	**TO**	**X**	**Y**	**Z**
		IMU	Port Antenna (Master)	-2.9719	-3.9140	-5.5310
		MRP	IMU	-49.5710	1.7110	-16.7990
		MRP	Transmit array	-4.3860	0.7110	9.2380
		MRP	Port Antenna (Master)	-52.5429	-2.2030	-22.3300
10	Westlake Raw	**Fan Tail**				
			Aft/Port	-86.737	-4.906	-3.617
			Forward/Port	-77.600	-4.881	-3.589
			Forward/Starboard	-72.590	6.676	-3.653

SBE 21 SEACAT Thermosalinograph Data Output Formats

This is extracted from page 33 of the SBE 21 SEACAT Thermosalinograph User's Manual (SeaBird Manual Version #022, 03/30/07).

The SBE 21 outputs data in raw, hexadecimal form as described below.

The inclusion of some output parameters is dependent on the system configuration - if the specified sensor is not enabled (see *Command Descriptions* above), the corresponding data is not included in the output data stream, shortening the data string.

• SBE 21 Format (**F1**) - ttttccccrrrrrruuuvvvwwwxxx (use this format if you will be using SEASAVE to acquire real-time data and/or SBE Data Processing to process the data)

• SBE 16 Format (**F2**) - #ttttccccrrrrrruuuvvvwwwxxxnnnn (custom format)

where

tttt = primary temperature

cccc = conductivity

rrrrrr = remote temperature (from SBE 38 or SBE 3 remote sensor)

uuu, vvv, www, xxx = voltage outputs 0, 1, 2, and 3 respectively

= attention character

nnnn = lineal sample count (0, 1, 2, etc.)

Data is output in the order listed, with no spaces or commas between parameters. Shown with each parameter is the number of digits.

Calculation of the parameter from the data is described below (use the decimal equivalent of the hex data in the equations).

1. Temperature

    temperature frequency (Hz) = (tttt / 19) + 2100

2. Conductivity

    conductivity frequency (Hz) = square root [(cccc * 2100) + 6250000]

3. SBE 3 secondary temperature (if **SBE3=Y**)

    SBE 3 temperature frequency (Hz) = rrrrrr / 256

4. SBE 38 secondary temperature (if **SBE38=Y**)

    SBE 38 temperature *psuedo* frequency (Hz) = rrrrrr / 256

5. External voltage 0 (if 1 or more external voltages defined with **SVx**)

    external voltage 0 (volts) = uuu / 819

6. External voltage 1 (if 2 or more external voltages defined with **SVx**)

    external voltage 1 (volts) = vvv / 819

7. External voltage 2 (if 3 or more external voltages defined with **SVx**)

    external voltage 2 (volts) = www / 819

8. External voltage 3 (if 4 external voltages defined with **SVx**)

external voltage 3 (volts) = xxx / 819

Example: SBE 21 with SBE 38 and two external voltages sampled,

example scan = ttttccccrrrrrruuuvvv = A80603DA1B58001F5A21

• Temperature = tttt = A806 (43014 decimal);

temperature frequency = (43014 / 19) + 2100 = 4363.89 Hz

• Conductivity = cccc = 03DA (986 decimal);

conductivity frequency =

square root [986 *2100) + 6250000] = 2884.545 Hz

• SBE 38 = rrrrrr = 1B5800 (1,792,000 decimal)

temperature *pseudo* frequency (Hz) = (1,792,000 / 256) = 7000 Hz

• First external voltage = uuu = 1F5 (501 decimal);

voltage = 501 / 819 = 0.612 volts

• Second external voltage = vvv = A21 (2593 decimal);

voltage = 2593 / 819 = 3.166 volts

Note:

SBE 21 always outputs an even number of voltage characters. If you enable 1 or 3 voltages, it adds a *0* to the data stream before the last voltage, as shown below:

• Remote temperature and 1 voltage enabled –

ttttccccrrrrrr0uuu or

#ttttccccrrrrrr0uuunnnn

• Remote temperature and 3 voltages enabled –

ttttccccrrrrrruuuvvv0www

#ttttccccrrrrrruuuvvv0wwwnnnn

Notes:

• Sea-Bird's software (SEASAVE and SBE Data Processing) uses the equations shown to perform these calculations; it then uses the calibration coefficients in the configuration (.con) file to convert the raw frequencies and voltages to engineering units. Alternatively, you can use the equations to develop your own processing software.

• See *Notes on SBE 38 Remote Temperature Data Output Format* below for details on how Sea-Bird handles SBE 38 data.